WORKERS' COMPENSATION RATEMAKING
(Selected Chapters)

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Biography

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WORKERS' COMPENSATION RATEMAKING

Abstract

Workers' Compensation pricing procedures are changing rapidly for several reasons:

- The advent of open competition and the movement to bureau loss costs in several states.
- The legislative enactment of benefit and administrative reforms, often with substantial but uncertain effects on loss costs.
- The growth of involuntary pools and the deterioration of industry earnings.

Private carriers, compelled to independently set rates, improvise alternative insurance programs, and quantify the expected effects of legislative reforms, are reexamining the bureau pricing methods. This paper reviews both the traditional ratemaking procedures and the modifications now being proposed by actuaries and economists, in the following sections:

- Sections 3 through 5 define the concepts used in ratemaking and the adjustments applied to historical data.
- Sections 6 through 8 review development, trend, and adjustments to current rate and benefit levels applied to premiums and losses.
- Sections 9 and 10 discuss the direct and indirect effects of benefit reforms.
- Sections 11 through 13 deal with more specific ratemaking topics: involuntary market burdens, expense constants, premium discounts, and assessments.
- Sections 14 and 15 analyze classification systems and relativities.
- Section 16 deals with occupational diseases and cumulative injuries.
- Section 17 provides illustrative exhibits.
- Section 18 reviews current issues, such as the evolving loss costs environment and alternative insurance programs.

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Because of space constraints, we are unable to publish the full text of this paper. Complete copies may be obtained from the author. Please send requests in writing to his CAS *Yearbook* address.

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Table of Contents

Section 1: Introduction

". . . the present plan merely represents the latest stage in the gradual evolution of an ideal rate-making method . . ." – Barber [1936], page 151.

Workers' Compensation pricing procedures are changing rapidly. Until the mid-1980's, the National Council on Compensation Insurance and regional bureaus developed advisory rates, which were adopted by most carriers. Independent pricing was largely confined to uniform rate deviations or policyholder dividends.

The advent of open competition in Workers' Compensation has stimulated a renewed examination of pricing procedures. In many jurisdictions, the bureaus now provide only loss costs, not advisory rates. Carriers must independently justify the profit and contingency provisions, expense loads, and often even loss development and trend factors.

Intensifying competition compels carriers to review other components of the premium rate as well: the loss costs estimates, the experience rating modification, and the classification system. The large involuntary pool burdens and special fund assessments necessitate additional analysis of expense costs. Finally, carriers must evaluate the cost implications of the Workers' Compensation reforms now being enacted in state legislatures.

Rate making procedures were generally uniform among the various bureaus. For instance, the full credibility standards and the "three halves" partial credibility formula have little actuarial justification, yet they have been used consistently by the rating bureaus. But this uniformity is quickly disappearing. Pricing actuaries – as well as the rating bureaus – now use a variety of methods for developing and trending both losses and premiums, evaluating law amendments, and determining profit and contingency provisions.

This reading has three purposes:

- It explains the pricing procedures currently used by the rating bureaus. Some procedures are common to most lines of business; these are reviewed briefly. Others are unique to

Workers' Compensation, such as the pricing of law amendments and the determination of classification relativities; these are explained in more detail.

The bureau rate making procedures are complex. Simplified examples are included with the text to clarify the exposition. Complete exhibits from recent rate filings, with accompanying description, are included in Section 17.

- Pricing actuaries, both with rating bureaus and with private insurers, have developed alternative rate making procedures for many aspects of Workers' Compensation pricing, particularly for loss development, loss and loss ratio trends, credibility, and profit and contingency provisions. For some of these procedures, there no longer is a "standard" procedure; the NCCI even uses different loss development procedures in different states. This paper reviews several of the alternative procedures and explains the rationale for each.

- Several aspects of Workers' Compensation rate making have recently been examined by economists and financial analysts, and some recommended changes are now being used by the rating bureaus and private insurers. Foremost among these are the economic incentives of law amendments and refinements of the classification system; see Sections 10 and 14. The advent of open competition and various Workers' Compensation reforms increase the need for accurate actuarial quantification of the complex effects of law amendments and classification systems.

This introductory reading can not do justice to all aspects of Workers' Compensation rate making, particularly to the procedures that are still evolving. Rather, this paper explains the basics, and directs the interested reader to more advanced articles on each subject.

Section 2: Overview

The pricing actuary determines premium rates that suffice for anticipated losses and expenses during the future policy period and that provide the insurer with a reasonable profit. Rates may be determined in two ways:

- The *loss ratio method* quantifies the needed revision from current rates.
- The *pure premium method* quantifies the required rate per unit of exposure.

The two methods are mathematically equivalent, though each has advantages and drawbacks (Stern [1965]; McClenahan [1990], pages 36-40). Workers' Compensation rake making uses the loss ratio method for overall statewide indications and the pure premium method for classification rates.

The segmentation of data offers another dichotomy for rate making. The actuary may revise rates for the state as a whole and then allocate the revision by classification. Alternatively, he may determine either classification rates or classification relativities and combine these into a statewide revision. In the past, Workers' Compensation emphasized the statewide rate revision. The rate changes for some classifications, termed "non-reviewed," ignored their specific experience and used the overall (industry group) revision. There is now growing emphasis on classification rates – all classifications are "reviewed" to some degree.

A. Ratemaking Variety

Workers' Compensation ratemaking procedures differ among the various bureaus, carriers, and jurisdictions. The differences occur in every part of the rate review. Even basic items, such as "What experience should be used?" receive divergent treatment:

- The old NCCI method used equal weightings of the most recent two policy years and the most recent calendar year. In 1983, the NCCI changed to equal weightings of the most recent policy year and calendar/accident year (in line with the New York procedure).

- Pennsylvania uses equal weightings of three projections:
  - The most recent calendar year (incurred losses),
  - A paid loss projection from the most recent policy year, and
  - An incurred loss projection from the most recent policy year.

- Minnesota uses equal weightings of paid loss projections from the most recent policy year and the most recent calendar/accident year. As supplementary information, it shows indications from case incurred loss projections and from total incurred loss projections.

- Many private carriers examining rate adequacy use longer experience periods, since the available data are less extensive.

All ratemaking procedures must be flexible. For instance, Section 15 notes the traditional limit on classification pure premium changes:

"the statutory benefit change + 50% *x* the industry group change ± 25%"

This limit is arbitrary: some pricing actuaries abide by it, some do not. And rare is the pricing actuary who feels entirely constrained by it. Consideration must always be given to judgmental or underwriting factors when determining rate levels.

A comprehensive survey, noting the procedures used by each bureau and by some of the major carriers, would be ill suited for the actuarial candidate first approaching Workers' Compensation ratemaking. Instead, this reading lists the prevalent (or a prevalent) ratemaking procedure. If two or more procedures are used by different bureaus or carriers, this reading sometimes lists more than one. An emphasis on or the exclusive documentation of a single procedure, should not be interpreted as an endorsement of that procedure.

B. The Extent of the Task

> *"Present-day rate making procedure . . . is in serious danger of being overbalanced by sheer weight of complexity."* – Michelbacher [1919], page 249.

Workers' Compensation rate making procedures are more complex than those used in other lines. The complexity begins with basic terms, such as

- What earned premium should be used: manual, standard, or net? What conversions among these bases are needed, and where should they be applied?

- What exposure base should be used: total payroll, limited payroll, or man-hours? How do benefits relate to each of these? How might other pricing procedures, such as experience rating, solve some of the exposure base problems?

The complexity extends through the final aspects of the review, such as

- How should the profit provision be chosen? The 1921 NAIC formula recommended a 2.5% underwriting profit; some carriers price to a 0% provision; the NCCI uses an internal rate of return model in some jurisdictions; and the Workers' Compensation Rating Bureau of Massachusetts uses a net present value model.

- How should classification pure premiums be determined? How much weight should be given to the classification's experience, the overall statewide experience, and the countrywide experience for that classification?

This reading covers the fundamentals of Workers' Compensation manual rate making. It does not deal with individual risk rating plans, except insofar as experience rating affects the ratio of manual to standard premiums and retrospective rating affects premium development patterns. It does not deal with financial pricing models for Workers' Compensation, or with the regulatory considerations regarding open competition versus administered pricing, except insofar as these affect the work required of the pricing actuary.

C. The Structure of this Reading

Rather, this reading covers the following topics:

- Section 3 notes the complexities of experience, exposures, premiums, losses, and expenses.

- Section 4 discusses the exposure bases used in pricing (total payroll, limited payroll, and man-hours), the rationale for each, and the modifications used for certain employers.

- Section 5 explains the adjustments applied to historical data: development, trend, and statutory changes.

- Section 6 discusses premiums:

  a) Premium development, with explanation of differences between retrospectively rated and prospectively rated policies; effects of the Tax Reform Act of 1986 with its "revenue offset" provision; and the changes by many insurers to booking premium as billed.

  b) *Bringing premium to the current rate level, with the procedures needed to accommodate* the skewed distribution of Workers' Compensation effective dates.

- Section 7 discusses loss development. An incurred loss development example is provided in the text, and a paid loss development example is shown in Section 17. This section also discusses the changing development patterns in the industry and credibility weighting procedures for loss development.

- Section 8 discusses loss cost trends and loss ratio trends, along with the rationale for each. Trends may be estimated using either internal (insurance) data or external (econometric) data; the relative advantages of each are presented. This section explains the differences between (a) Workers' Compensation indemnity and medical trends, on the one hand, and (b) CPI wage and medical care inflation indices, on the other hand. It then discusses the changes

in the Workers' Compensation environment and their effects on loss cost trends.

- Section 9 shows how to quantify the direct effects of statutory amendments: replacement rates, lengths of disability, waiting periods, and benefit limitations.

- Section 10 discusses the indirect "incentive" effects of statutory amendments on claim frequency and durations of disability. This section notes the types of incentive effects; the magnitude of these effects; the variations by type of injury and worker characteristics; and the effects of medical fee schedules and limits on attorney reimbursement.

- Section 11 deals with involuntary market burdens and methods of quantifying them. It presents explanations for the growth of the pools and the implications for pricing, and discusses alternative Workers' Compensation programs that alleviate the burdens.

- Section 12 deals with differences between large and small risks and the ratemaking procedures used to compensate for them, such as expense constants and loss constants. It describes the reasons for these differences: per policy expenses, economic incentives from experience rating modifications, and economies of scale.

- Section 13 shows the calculation of the overall statewide rate change, along with several factors peculiar to Workers' Compensation rate making, such as premium discounts and assesssments for special funds.

- Section 14 deals with classification systems. It shows the rationale for the current classification system, describes the differences between classification by product type and by job characteristics, and discusses alternative classification dimensions, such as

  a) age and sex of the work force.
  b) group health benefits provided by the employer,
  d) territory and claims consciousness, and
  c) financial health of the industry.

- Section 15 deals with classification rate making:

  a) industry group relativities,
  b) underlying pure premiums, state indications, countrywide indications,
  c) law differentials and experience differentials, and
  d) classification credibility procedures.

- Section 16 deals with occupational disease claims, such as asbestosis, stress claims, and psychological disorders. Of particular concern to the pricing actuary are (i) accident year or policy year effects versus (ii) report year or calendar year effects, and how these effects should be included in loss development and trend.

- Section 17 provides illustrative exhibits showing the variety of methods now used for Workers' Compensation ratemaking:

  a) Advisory exhibits from the 1991 Minnesota rate filing (a loss cost state).
  b) NCCI expense and profit exhibits from an administered pricing state.
  b) Alternative benefit trend exhibits from the California Workers' Compensation bureau.
  d) Direct and indirect (incentive) "law amendment" effects.

- Section 18 concludes this reading with current issues relevant for the Workers' Compensation pricing actuary, such as the evolving loss costs environment and alternative Workers' Compensation programs.

Section 5: Experience Adjustments

> *". . . the goal of the ratemaking process is to determine rates which will, when applied to the exposures underlying the risks being written, provide sufficient funds to pay expected losses and expenses; maintain an adequate margin for adverse deviation; and produce a reasonable return on (any) funds provided by investors."*
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> – McClenahan [1990], page 33

Ratemaking is prospective. When preparing a rate review, the actuary asks: "Will premiums collected during the future policy period be sufficient to cover expected losses and expenses?" To determine the needed rates, historical experience is examined, adjusted for known or expected differences between the experience period and the future policy period.

Three types of adjustments are used in Workers' Compensation ratemaking: development, trend, and benefit changes.

A. Development

Observed data reported soon after the close of the experience period may not reflect full values. Workers' Compensation premiums are adjusted by payroll audits about three to six months after the policy expires. Loss estimates are revised as the extent of the injury becomes clearer. Some expense elements, such as contingent commissions and guarantee fund assessments, have similar lags.

Many rate making values become better known with the passage of time. For instance, ultimate loss costs are known only after all claims are settled. The observed losses depend on the valuation date. *Development* is the change in the observed values over time.[7]

Even when the observed values differ significantly from ultimate values (i.e., development is

[7] Compare Cook [1970], page 2: "A calculated past ratio of mature to immature data is called a loss development factor," or CAS [1988], page 58: "Development is defined as the change between valuation dates in the observed values of certain fundamental quantities that may be used in the loss reserve estimation process"; so also Wiser [1990], page 161). Weller [1991] says: "Often the values of observations change as we learn more about the subject that we are studying. Actuaries call such changes 'development.'"

great), the *pattern* of development may be stable. For instance, the paid losses at the end of an accident year may be only a fraction of the ultimate value. But this fraction may be stable: 20% in one year, 21% the next year, 19% the next year. The observed values plus a stable development pattern allows a good estimate of the ultimate values.

External developments may change development patterns. For instance, the 1986 federal income tax amendments caused insurers to modify their WC premium booking procedures and thereby changed premium development patterns. Similarly, statutory modifications of maximum durations of indemnity benefits change loss development patterns. The actuary must quantify the effects of these changes when estimating ultimate values (see Sections 6 and 7).

B. Trend

Inflation causes nominal values to change over time. For instance, payroll increases with wage inflation; medical benefits increase as physicians' fees rise; accident frequency changes with technological improvements in workplace safety.

Actuaries divide loss cost trends into three types: economic inflation, social inflation, and other trends. *Economic inflation* is the change over time in the purchasing power of a dollar. It is measured by econometric indices, such as a CPI index or a GNP deflator, though it will vary by benefit type (e.g., the medical inflation rate differs from the wage inflation rate). *Social inflation* is the change over time in public attitudes that affect insurance losses, such as changing claims consciousness, more liberal jury awards, and changing expectations of compensation. *Other trends*, such as frequency trends, are systematic non-monetary changes affecting insurance values, such as a decline in workplace fatalities resulting from OSHA regulations or from the movement from a manufacturing to a service economy.[8]

Trends may be estimated either from internal insurance data, such as historical claim sizes, or from external econometric data, such as CPI indices (Masterson [1968]). Internal trends are often preferred when other forces besides economic inflation affect insurance values. External

[8] The ratio of fatalities to permanent total disabilities has declined from 15 to 1 at the beginning of this century to about 1 to 1 now, reflecting greater workplace safety and better medical treatment; cf. Downey and Kelly [1918], page 261.

trends are valuable when the trend values chosen must be justified to regulators or when the expected future trend differs from the historical average.

If the exposure base is not inflation sensitive, such as car-years in Personal Auto, only loss trends are used. If the exposure base is inflation sensitive but not necessarily related to loss inflation, such as receipts in Products Liability, separate premium and loss trends are used.

In Workers' Compensation, the exposure base (payroll) is inflation sensitive and directly related to indemnity benefits. Rating bureaus use loss ratio trends. The divergences between (i) wage and medical inflation and (ii) Workers' Compensation indemnity and medical benefit trends, and the need to explain these differences to regulators, leads some pricing actuaries to prefer separate premium and loss trends (see Section 8).

C. Benefit Changes

Workers' Compensation statutory benefits are frequently modified by legislative enactments. For instance, a state may raise the weekly maximum for indemnity benefits, increase the duration of scheduled benefits, or change the administrative handling of cases.

Benefit changes have both direct and indirect effects. The direct effect considers the change in compensation, not changes in claim frequency or severity. For instance, if the indemnity benefit is raised 20%, indemnity claim costs will rise 20%. In practice, the higher benefit level may encourage greater filing of claims and longer durations of disability. The indirect "economic incentives" may raise indemnity claim costs another 10%, though the actual effect depends on the benefit structure, the characteristics of the workforce, and the economic environment (see Sections 9 and 10).

The direct effects are removed from loss and premium trends. The indirect incentive effects work more slowly and are harder to quantify. It is difficult to discern whether loss cost trends in excess of wage or medical inflation indices stem from economic incentives caused by benefit changes or from changing social expectations unrelated to statutes.

Section 8: Loss Trends and Loss Ratio Trends

Inflation raises the nominal costs of insurance premiums and losses. Accordingly, the pricing actuary adjusts historical experience with inflation trends to project future cost levels. In lines with exposure bases that are not inflation sensitive, such as Personal Auto liability, only losses are trended. In lines with exposure bases that are inflation sensitive but are not directly related to cost trends, such as General Liability, premiums and losses are trended separately.

In Workers' Compensation, the exposure base, payroll, is inflation sensitive. Indemnity benefits are a function of wages, so the indemnity loss cost trend should be similar to the exposure trend. During the 1960's, when industrial productivity increases were high and so wages rose rapidly, medical inflation was also similar to wage inflation.

The NCCI uses a loss ratio trending procedure, with credibility adjustments based on the goodness of fit of the empirical observations with a linear trend. Since inflation of wages and indemnity benefits should be similar, the complement of credibility for indemnity was originally set at "no trend." [Empirical data shows that indemnity benefits have been increasing more rapidly than wages, so the NCCI now uses the countrywide trend for the credibility complement.] Since medical inflation differs from wage inflation, the complement of credibility for medical is the countrywide medical trend, with different figures for states with an effective medical fee schedule and states with no schedule.[25]

A. Inflation and Benefit Trends

> *"When wage rates are increasing, payrolls are increased and more premiums are collected. Indemnity losses which are based on wages will increase, but not to the same extent as premiums. Therefore, rate levels as otherwise calculated should be reduced in order to avoid excessive premiums."* – Allen [1952], page 59.

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[25] Marshall [1954] and Kallop [1975] use no trend procedure; in their reviews of Kallop's paper, Gruber [1976] and Scheibl [1976] note that New York and the NCCI began using trend procedures.. NCCI [1985] describes the loss ratio trend which is now used in rate filings.

Forty years ago, Workers' Compensation pricing actuaries wondered whether premium rates should be reduced because of wage inflation. Edward Allen presented the "wage factor" procedure along with arguments for and against it. Harwayne [1953] noted that the "wage factor represents a technical adjustment to reflect recent conditions and is therefore on a par with the adjustment of experience to reflect current rate levels and current law levels" (page 28). Skelding [1953] noted the higher benefit trends than wage trends and says that "the injection of a so-called wage trend factor in the compensation rate structure would be a tragic mistake" (page 21).[26]

During the late 1970's and 1980's, loss cost trends for both medical and indemnity benefits have far exceeded wage inflation: about 14% per annum for medical, 10% for indemnity, and 6% for wage. The disparity between wage inflation and Workers' Compensation benefit trends has been increasing: although wage inflation has declined from 8% in the late 1970's to 4% in the mid-1980's, neither medical nor indemnity benefit trends have fallen as much.[27]

The disparity between wage inflation and WC benefit trends stems from several causes:

- Technological advances in medical treatment: more expensive equipment and complex therapeutic procedures.
- Increasing utilization of medical services, even for minor injuries.
- Patient "claim shifting" from employer provided health insurance plans with high

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[26] Wage level factors were often used in early ratemaking analyses. For instance, 1918 Pennsylvania rate revision used an average factor of 0.92 for all classifications except coal mining (Downey and Kelly [1918], page 266). Such factors are more justified when the state has a low indemnity benefit maximum (*ibid.*, page 266-267). Gruber [1976], page 57, notes that "due to the inflationary growth of payroll and therefore the growth of premium without any compensating increase in risk, a wage factor is used to decrease the New York experience-indicated rates."

[27] On medical, indemnity, and wage trends, see Ryan and Fein [1988], pages 43-45, Hager [1991: Call for Reform], page 7, and NCCI [1991: Issues Report], page 32. Kaufmann [1990], using state data for one insurer, finds a consistently higher Workers' Compensation medical severity trend than the CPI medical costs index; see also the studies by the California WC Rating Bureau. Before the 1970's, the relationship of Workers' Compensation medical costs and wage inflation was less clear. NCCI [1991: Issues Report], p. 29, notes that "prior to [1975], wage inflation had generated enough premium to overcome indemnity and medical loss changes." [Boden and Fleischman [1989] and Victor and Fleischman [1990] note that Workers' Compensation medical benefit trends were lower than medical inflation during the early and mid-1970's but greater than medical inflation in the 1980's.] Early studies have often shown a higher trend for medical benefits than for wages (Mowbray [1919]; Greene and Roeber [1925], p. 255; Skelding [1953]).

deductibles and co-insurance payments to first-dollar Workers' Compensation benefits; physician "cost shifting" from limited reimbursement plans, such as Medicare, to higher reimbursement private insurance coverages, such as Workers' Compensation.

- Lengthening durations of disability, particularly when replacement work is not available.
- Increasing frequency/compensability of high-cost psychological injuries and occupational diseases in certain jurisdictions.
- Greater attorney involvement in Workers' Compensation claims.[28]

Loss cost trends are frequently contested in rate filings, especially if the causes of the trend are neither intuitive nor explained. The use of loss ratio trends masks these causes: it is more difficult to interpret increases in loss ratios than in average claim costs.[29]

B. Internal Data and External Indices

Trend factors can be based on either (i) observed changes in average benefit costs or (ii) econometric modeling of loss cost trends with external inflation indices, such as the CPI. When the causes of the observed trends are not well understood, observed benefit trends may be more reliable. Econometric modeling, however, separates the influences on loss cost trends into their components, such as economic inflation, utilization, durations of disability, and claim filing patterns. Similarly, analyses of attorney involvement in insurance claims may explain rises in claim frequency, average claim severity, and loss adjustment expenses. Econometric modeling and analysis of attorney involvement provide qualitative justification for Workers' Compensation trend factors.

Loss ratio trends incorporate both claim severity and claim frequency. If exposures and losses

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[28] See Appel [1989]; Boden and Fleischman [1989]; Victor and Fleischman [1990]; Borba [1989]; Pillsbury [1991]. Appel notes several additional factors, such as (a) rising costs of medical malpractice coverage and defensive medicine, (b) demand creation by physicians, and (c) an oversupply of physicians in urban areas. Gots [1990], pages 39-40, also emphasizes the entitlement expectations of consumers for high quality medic

[29] Note particularly the observation by Mintel [1983], p. 167: ". . . several insurance commissioners have rejected trending evidence based on an analysis of internal loss and expense experience presented in support of a rate filing in favor of external evidence of factors outside insurance company control that may affect future losses." Perkins [1922], page 272, also argues for separate payroll and loss projection factors.

are trended separately, both claim severity and claim frequency trends should be estimated.

In other lines of business, increases in claim frequency often stem from the addition of small, marginal claims. In Personal Auto, for example, severe injuries always led to insurance claims. The increasing claims consciousness of the public and attorney involvement in insurance claims, however, causes a higher incidence of small claims. This phenomenon depresses average claim costs (though not enough to offset economic and social inflation).

In Workers' Compensation, increases in claim frequency often result from newly mandated compensability of occupational diseases, psychological injuries, and stress claims, or from attempts to use Workers' Compensation as a substitute for early retirement. These are all high cost claims, so increases in claim frequency may raise average claim severity.

C. Loss and Exposure Trends

Exposure grows by increases in hourly wages and increases in the number of workers; only the former is needed for the trend calculation. Historical experience and future projections of average hourly wages are published by econometric consulting firms, such as DRI or Wharton.

The loss cost trend may be estimated in two ways:

- Fit average claim severities values to a curve. Average claim severities may be incurred values (case incurred losses divided by reported claims) or paid values (paid losses on closed claims divided by the number of closed claims). The observed values are usually fit to either a straight line or an exponential curve.

- Compare average incurred or paid values to an econometric index. For medical benefits, the econometric index may be the CPI medical cost index. For indemnity benefits, the index may be an average wage level index. Econometric indices are generally available only for countrywide data, though state specific figures may help to account for regional economic

differences.[30]

Linear and Exponential Trends

Until recently, Workers' Compensation used linear trend factors. If the average cost of an indemnity case was $2,000 in 1992, and a 10% per annum trend was expected, the assumed average indemnity cost was $2,200 for 1993, $2,400 for 1994, $2,600 for 1995, and so forth. The expected trend was determined by fitting a linear regression (McClenahan [1990], page 51):

$$y = ax + b$$

where y is the average claim cost in each year,
a is the annual trend,
x is an index for the year, and
b is a constant.

Linear trends often underestimate future costs, since inflation is multiplicative, not additive. In the example above, with a 1992 average cost and a 10% expected trend compounded annually, the assumed future costs should be $2,200 in 1993, $2,420 in 1994, $2,662 in 1995, and so forth. The corresponding regression is

$$y = be^{ax}$$

where the parameter and variables have the same meaning.

In June 1990, the NCCI converted to an exponential trend function, as is used in other liability lines of business. To fit the exponential model, the exponential equation can be transformed into a linear equation by taking natural logarithms (McClenahan [1990], page 51):

$$ln\ (y) = ax + ln\ (b)$$

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[30] See, for instance, DRI [1991]: "The Workers' Compensation Insurance Rating Bureau of California has asked the Cost Information Service of DRI/McGraw-Hill to develop and forecast an input price (market basket) index that measures escalation in operating costs of California hospitals. The hospital escalation projection will be used by the Bureau's Actuarial Committee in developing premiums for workers' compensation insurance" (Exhibit 2, Sheet 4), and "Over the period 1985 to 1990, the escalation rate of the California index was higher than that of the national index in every year other than 1988, reflecting the relative relationship of the corresponding wage proxies" (Exhibit 2, Sheet 3).

[Methods for solving these equations are reviewed in Wheelwright and Makridakris [1989], pages 163-170, or DeGroot [1975], p. 501. See Section 17.D.1 for a complete illustration.]

Econometric Indices

Workers' Compensation benefit trends are partially dependent on monetary inflation: indemnity benefits are linked to wage levels, and medical benefits are linked to medical inflation. Economists provide projections of future inflation indices, and expected benefit trends may be derived from these (Masterson [1968]).

Such techniques are particularly important when macro-econometric changes affect expected inflation. For instance, Workers' Compensation benefit trends were over 15% per annum in the early 1980's, when monetary inflation was high. Many actuaries expect benefit trends to be somewhat lower in the early 1990's, since monetary inflation has decreased.

During the 1980's, benefit trends have exceeded monetary inflation, since "social inflation" and "cost shifting" affect Workers' Compensation benefits. A regression of benefit trends on inflation trends yields a positive constant factor. For instance, a regression of medical benefits on the medical CPI index may yield

$$\textit{Medical benefits} = \textit{medical CPI} + 5\%.$$

Thus, a medical CPI trend of 8% one year would imply an expected Workers' Compensation medical benefits trend of 13%.

The table below illustrates this procedure, using simulated Workers' Compensation medical data and the medical CPI inflation index.

Accident Year	Incurred Medical Benefits	Medical Claim Count	Average Severity	Medical Benefit Trend	Medical CPI Trend
1979	4,714	12,405	380		
1980	5,680	12,850	442	16.3%	11.0%
1981	6,782	13,067	519	17.5	10.7
1982	7,965	12,993	613	18.1	11.6
1983	8,793	12,420	708	15.5	8.6
1984	10,919	13,365	817	15.3	6.3
1985	12,745	13,544	941	15.2	6.3
1986	15,103	13,881	1,088	15.6	7.7
1987	18,044	14,493	1,245	14.5	6.6
1988	21,926	15,650	1,401	12.5	6.5
1989	25,389	16,008	1,586	13.2	7.6
1990	29,077	16,109	1,805	13.8	9.1

The data show a spread of about 4 to 7 points between the medical benefit trend and the medical CPI trend. For a 1991 medical CPI of 8 to 9% expected in 1990, the expected 1991 medical benefit trend is about 13.5%.

D. Loss Ratio Trends

The Workers' Compensation exposure base, payroll, is inflation sensitive. Average wage changes, though, have been about 5 to 10 points below average benefit trends in many jurisdictions. Instead of using separate trends for benefits and premiums, standard bureau ratemaking procedures use a loss ratio trend.

Policy year or accident year loss ratios are formed with premium at current rate levels and losses at current benefit levels. A consistent trend in loss ratios indicates consistently different benefit and premium trends. The loss ratio trend may be applied to the developed experience period loss ratio to project expected loss ratios in the future policy period.

The observed loss ratio trends vary over time and by jurisdiction. They stem from numerous factors, as Michelbacher [1919] notes:

"Such a comparison [of loss ratios over time] measures collectively such factors as changes

in wage level, amendments to the benefit schedules, greater liberality on the part of administrative claim bodies in interpreting workmen's compensation laws, a possible tendency on the part of claimants to malinger and to present fraudulent claims, the influence of immigration and emigration, variations in accident frequency and severity rates or in employment and unemployment, and, in fact, any and all influences acting upon the cost" (page 244).

The pricing actuary should investigate the probable causes of the trend, since changes in the causes affect the expected future trend. For instance,

- If the primary cause is economic incentives of statutory amendments, then the enactment of a law change should be carefully examined for its potential influence on the benefit trend (see Section 10).

- If the primary cause is a "tendency to malinger and present fraudulent claims," then the organization of an insurance fraud unit may reduce the future trend rate.

- If the primary cause is "variations in unemployment," then macroeconomic developments will influence the future benefit trend (see Section 14).

For a complete illustration of loss ratio trends, see Section 17.D.1.

Credibility for Trend

Observed benefit trends in small states fluctuate widely from year to year. The NCCI loss ratio trend procedure considers the "goodness of fit" of the observed annual trends to an exponential curve. The "squared residual," or the square of the difference between the observation and the fitted point, measures the explanatory power of the regression. The smaller the sum of the squared residuals for all policy years, the greater is the credibility accorded to the statewide trend.[31]

[31] Scheibl [1976], page 64, notes the earlier credibility procedure: "Subsequent to the presentation of Mr. Kallop's paper, the National Council introduced loss ratio trend into its ratemaking procedure to recognize the imbalance of social and economic inflationary influences on premiums and losses. . . . Observed trends are adjusted

A variety of trend factors may be used for the complement of credibility. Originally, a trend factor of unity was used as the complement for the indemnity loss ratio trend, on the supposition that wage inflation should be about the same as indemnity benefit trends (NCCI [1985]). In October 1990, the NCCI began using the countrywide indemnity trend as the complement for the statewide trend. For medical benefits, the countrywide trend is used as the complement, though the trend figure depends on the type of medical fee schedule in the state under review. Using policy year 1985-1989 data, NCCI's countrywide trends were:

Indemnity:	+7.0%
Medical – Jurisdictions with effective fee schedules:	3.6
Jurisdictions without effective fee schedules:	12.5
Medical – All Jurisdictions:	10.4

E. Length of the Trend Period

The trend period extends from the average accident date in the experience period to the average accident date in the future policy period.

- *Policy Year Experience:* A policy year considers accidents resulting from policies issued in a given time period. For instance, policy year 1992 covers accidents resulting from policies issued between January 1, 1992, and December 31, 1992. These policies are in force from 1/1/92 to 12/31/93, and the average accident date is 1/1/93.

- *Accident Year Experience:* An accident year considers accidents occurring in a given time period, so the average accident date is the midpoint of that period (assuming no change in exposures). Thus, the average accident date for accident year 1992 is 7/1/92.

for credibility using a Spearman Rank Correlation D-statistic approach." These credibility procedures are unusual. Milliman and Robertson recommend that the NCCI adopt a "Bayesian credibility [procedure] for weighting state and countrywide trend indications. . . . credibility should be based on a measure of volume, or possibly 'volume plus a constant,' instead of the current quality of the line fit." More advanced discussions of credibility procedures for trend may be found in Hachemeister [1975] and Venter [1986].

- *Calendar Year Experience:* Calendar year experience considers financial transactions occurring in a given time period. For losses, these consist of paid losses and changes in loss reserves. Since both paid losses and changes in loss reserves relate to accidents occurring the past, the average accident date for calendar year experience is often before the midpoint of the period. Since the true average accident date can not be easily quantified, the assumption of the midpoint of the calendar year is commonly used.

A rate review using experience from policy year 1989 and accident year 1990 to set rates for policy year 1992 has average accident dates of

- January 1, 1990, for policy year 1989.
- July 1, 1990, for accident year 1990.
- April 1, 1990, for the experience as a whole.
- January 1, 1993, for policy year 1992.

The length of the trend period is therefore 2.75 years: 4/1/90 to 1/1/93.

Sections 10: Law Amendments - Incentive Effects

> *"Enough experience has now developed so that we know with reasonable exactness what change in cost an amendment to the workmen's compensation law will carry with it. If the waiting period is reduced or the percentage of wages, which is the basis of compensation payments, is increased or any one of numerous changes in benefits is made, we can foretell almost with certainty just what the result will be when measured in terms of cost."* – Michelbacher [1919], page 245.

Actual loss costs have climbed far more quickly after law amendments than the traditional projections predicted, since strong but indirect economic incentives are generated by legislative enactments. In particular, statutory revisions affect the following:

1. *Claim Filing:* Greater benefits and easier access to compensation stimulate more reports.

2. *Durations of Disability:* Higher benefit levels and the removal or weakening of time limits on indemnity payments cause lengthening durations of disability.

3. *Mix of Benefits:* Changes in reimbursement levels by type of injury affect the expected mix of benefits, particularly for temporary total and permanent partial disabilities.

4. *Non-Compensation Medical Benefits:* Changes in the deductible and coinsurance provisions in governmental or group health plans affect the claim frequency of occupational injuries and diseases.

5. *Attorney Involvement:* Changes in administrative procedures may influence attorney involvement in Workers' Compensation claims, which in turn affects claim frequency and severity.

6. *Compensable Injuries and Diseases:* Changes in the definition of occupational injury and disease affect the types of claims reported.

Direct effects are immediate; indirect effects emerge slowly. The indirect effects are often hard to disentangle from loss cost or loss ratio trends, but separating indirect economic incentives from loss trends is essential for competitive pricing. For instance, suppose a statutory amendment defines certain "stress" claims as compensable. The indirect incentive effects are gradual. As workers learn what types of stress claims may be pressed, and as they see other workers receiving benefits for stress claims, there will be a steady rise in claim frequency.

If the indirect effects of law amendments are not properly priced, the increase in stress claims will appear as a loss ratio trend or as a loss cost trend. This may mislead the pricing actuary, for two reasons:

- The rate of increase in stress claims will be greatest soon after the law amendment and will taper off to zero after several years.

- The rate of increase in stress claims will vary by classification, depending on the types of stress claims deemed compensable.

A. Claim Frequency

The indirect economic effects of law amendments on claim frequency and durations of disability are quantified by econometric analyses, not by *a priori* intuition. In the early 1980's, several economists considered the effects of benefit levels on claim frequency for temporary total, major permanent partial, and minor permanent partial injuries. Butler and Appel [1983], for instance, find that both wage and benefit levels affect claim frequency: injury claims increase as wages fall and as benefits increase.

Gardner [1989], page xiii, summarizes previous studies as "A 20 percent benefit increase is estimated to have a 7 percent increase on temporary disability claims." The National Council on Compensation Insurance [1991], in an admitted understatement, uses a 1% overall indirect effect of statutory amendments. Other rating bureaus sometimes avoid quantifying the indirect effects explicitly and include them instead in the loss ratio trend (see below).

A New York Example

In 1990, New York increased the maximum benefit for temporary partial disabilities from $150 a week to $340 a week. The direct effect of this change was a 1.6% increase in temporary partial benefits.

A more complete analysis must consider several aspects of the pre-1990 New York benefits:

- Temporary partial claims were infrequent, accounting for only 1% of all benefits.

- The average weekly indemnity payment on temporary partial claims was $77.04, well below the maximum of $150. For temporary total claims, the average weekly benefit was $266.03, close to the pre-1990 maximum of $300.00.

  Two factors contribute to this disparity. First, temporary partial benefits are two thirds of the *difference* between pre-injury and post-injury wages, whereas temporary total benefits are two thirds of pre-injury wages. Second, the low maximum for temporary partial benefits induced high wage workers to avoid these claims and return to work full time.

  Both factors are important. The increase in the maximum benefit does not affect the first factor. But it removes the disincentive for filing temporary partial claims, so it will increase claim frequency. Moreover, since temporary partial claims often develop into permanent partial claims, claim frequency for all partial claims may increase.

The effect of benefit levels on claim frequency depends on the subjectivity of the injury: permanent total claims are least affected by benefit provisions and temporary partial claims are most affected (Butler and Worrall [1983]). There are no hard rules for estimating the effects, since they depend on various aspects of the benefit system. Given the low pre-1990 frequency of temporary partial claims in New York, the pricing actuary might estimate that the frequency will increase substantially. These indirect incentive effects occur gradually, so even *post hoc* tests of these presumptions are difficult.

Benefit Levels and Claim Frequency

There are several explanations for the relationship between benefit levels and claim frequency, each of which demands a different response from the pricing actuary. As benefits are increased, workers may have more incentive to file claims, less incentive to be careful on the job, or more incentive to bear additional risk on the job. Economic research on "compensating differentials" pertains to the last of these three (Dorsey [1983]; Worrall and Appel [1988]). As benefit levels increase, workers chose riskier occupations, since the economic loss from industrial accidents diminishes. Although there is some evidence for this effect, the influence on overall Workers' Compensation costs is probably minor.

Higher benefit levels may leave employees with less incentive to be careful on the job. However, employers have more control over workplace hazards. Higher benefit levels induce large employers, who are experience rated or retrospectively rated, to emphasize safety controls and loss prevention activities.[34] The employer incentives probably override the employee incentives regarding job safety. For instance, OSHA finds a continuing decline in workplace fatalities and severely disabling injuries over the past decade, though this stems from both employer safety incentives and the transition from a manufacturing to a service economy.

For claim filing, however, employee incentives generally override the employer and macroeconomic effects. Moreover, increased filing of minor claims may increase the number of major claims as well. For instance, reductions in the waiting period may stimulate numerous temporary total claims for short durations of disability. Some of these temporary total claims then develop into permanent partial claims, as accident victims become accustomed to the

[34] Gardner [1989], page 79, summarizes several studies: "Chelius and Smith (1983) found no significant effect from less-than-full experience rating on injury rates. But Butler and Worrall (1988) found that, in larger firms, which are likely to have a higher degree of experience rating than are smaller firms, indemnity costs differ less in response to benefit differences than they do in smaller firms. Their data were observations at the establishment level in eleven risk classes in thirty-eight states for 1980 and 1981. Ruser (1985) analyzed BLS time-series data for twenty-four manufacturing industries in forty-one states from 1972 through 1979. He found the response of injury rates to benefit changes to be four times higher in small firms than in large firms. Similarly, with data in one state - South Carolina - over the long period from 1940 through 1971, Worrall and Butler (1988) also found that industries with relatively more employees per firm had smaller changes in injury rates when benefits increased than did industries with fewer employees per firm." See also Harrington [1988]; Chelius [1974; 1982; 1983]).

compensation benefits.

B. Durations of Disability

Economists have also examined the effects of benefit levels on the duration of disability. Economists often apply a "reservation wage" model derived from unemployment studies to the analysis of Workers' Compensation durations of disability. The reservation wage is the amount required to induce an individual to accept an employment offer. For injured workers, the benefit level is similar to the reservation wage: as benefit levels increase, injured workers are less likely to return to work (Butler and Worrall [1985], page 718).

Several phenomena hinder the quantification of duration effects.

- Many claims are "right-censored" in rating bureau data bases, in that the disability has not yet ended.
- The future duration of a claim may be dependent on the past duration: that is, the longer a worker has been receiving disability benefits, the less likely he may be to return to work.[35]
- The effect of benefit levels on the duration of disability varies by type of injury: it is strongest when the disability is hard to monitor, as in temporary total low back claims, and it is weakest for more severe claims.

The incentive effect of benefit levels on the duration of disability is strong. The estimated amount varies with the type of injury and the assumed dependence of future duration on past duration. A 10% rise in benefit levels appears to raise durations of disability by at least 2% (Butler and Worrall [1985], page 722; Gardner [1989], pages xiii, xv). For *temporary total*

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[35] Cf. Butler and Worrall [1985], pages 720-721: "This is a case of duration dependence – as the length of time on a claim increases, the instantaneous rate at which one changes from disability to nondisability status will decrease and expected duration will increase. Simply put, the longer one is on a claim the less likely one is to leave it to return to the work force when duration dependence is present. . . . Perhaps the length of a claim makes it increasingly difficult to return to work because of depreciation in market-oriented human capital." Quantifying duration dependence is difficult in non-homogeneous samples: "Unfortunately, in the presence of unobserved heterogeneity across claimants duration dependence may appear to characterize the sample data even if it does not exist for any of the individual observations. . . . Even if the transition rate out of Workers' Compensation is fixed to each individual, because the impact of the unobservable differences sort out higher hazard individuals first, there will appear to be some duration dependence" (page 721).

low back claims, if one assumes that the longer a worker is on disability, the less he desires to resume regular employment, a 10% rise in the benefit level may induce as much as a 9% increase in the length of disability (Butler and Worrall [1985]). (If one includes the 4% rise in claim frequency discussed above, the total loss cost increase is 25% [=10% + 9% + 4%].)[36] This phenomenon, however, is weaker for other types of injury, and other economists dispute its overall strength. The "duration elasticity" for all Workers' Compensation claims combined is probably between 10% and 40%.[37]

In incentive effects vary with the compensation system. In states with wage loss benefits for permanent disability claims, such as Florida, the award depends on the post-injury wages earned by the employee, thereby increasing incentives to stay out of work (Gardner [1989], pages xvi-xvii, 2; Brainerd [1987]). In addition, when benefit increases vary by type of injury, the mix of claims will shift towards those injury types whose benefits increase most.

Long-Term Disability Studies

Life and health actuaries have analyzed the effects of benefit provisions and economic conditions

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[36] Similarly, Gardner [1989], page xv, says: "The literature suggests that a 20 percent increase in temporary total benefits (replacement rates) to all benefit recipients would increase aggregate payments by *at least* 30 percent. This reflects the direct effect of 20 percent and an average of at least 10 percent in additional utilization. Duration would increase by at least 4 percent, while claim-filing rates would rise by about 6 percent." In a recent study of the statutory increase in the maximum weekly indemnity benefit in Connecticut from 100% to 150% of the average weekly wage, WCRI [1991: CN] found that the indirect effects were as great as the direct effects, suggesting that the previous estimates may have been understated.

Gardner [1989], page 40, also summarizes an unpublished study by Dionne and St.-Michel that differentiates between cases that are relatively easy to diagnose, in which no moral hazard component emerges, and those that are difficult to diagnose (back and spinal disorders). . . They find durations of disability to be an average of approximately 10 percent longer overall among claimants who are treated more favorably by the plan. Those claimants with difficult-to-diagnose injuries who are favorably treated under the disability plan have durations of disability about 30 percent longer than those with similar injuries who are treated less favorably; those with easily diagnosed injuries show no difference in duration from more favorable treatment under the plan."

[37] Butler and Worrall [1988] have tested the wage reservation model for the distribution of Workers' Compensation loss costs with curve fitting techniques. Indemnity costs are the product of three variables:

- the probability of filing a successful claim,
- the duration of disability, and
- the benefit level.

A pure chance generation of costs, with no effect of benefit levels on claim frequency or disability durations, would suggest a lognormal distribution of losses, whereas a reservation wage model would suggest a Weibull distribution of losses. The consistency of the reservation wage model with the observed distribution of losses is a check on the reasonableness of the economic incentives phenomenon.

on long-term disability (Kidwell et al. [1985a; 1985b]). Long-term disability termination rates dropped in the late 1970's, in response to worsening unemployment, and they rose in the early 1980's, as the economy prospered.

The effects of policy provisions are difficult to quantify in Workers' Compensation, since benefits are mandated by state statute. Long-term disability benefits vary widely among carriers as well as among policyholders, so the effects of benefit levels on the duration of disability are more easily discernable. [The new statutory disability tables published by the Society of Actuaries show these influences.] Casualty actuaries can use the health insurance results to predict the effects of statutory revisions in Workers' Compensation.

C. Claimant Characteristics

The indirect effects on claim reporting and durations of disability vary by claimant characteristics (Borba [1989]). Three groups of accident victims show the largest effects:

1. *Non-Primary Wage Earners:* If benefit levels during disability are lower than the pre-injury wage, primary wage earners often feel compelled to return to work. Secondary wage earners, such as spouses of the primary wage earner, show a greater response to economic incentives.[38]

2. *Low-Income Employees:* Lower income employees are affected by changes in maximum disability benefit levels more than higher income employees are. Moreover, they have less assets and are more dependent on current income. Benefit level changes have the greatest indirect economic effects on lower wage earners (Gardner [1989], page 58; but contrast

[38] Much of this research is from unemployment insurance studies, with the somewhat biased assumption that men are primary wage earners and women are secondary wage earners. Gardner [1989], pages xiii-xiv, notes: "A wide variety of studies document the greater labor market responses of women, especially married women, to economic incentives. An early study found that a 20 percent increase in wages would produce a 40 percent increase in work activity among women but only a 7 percent increase among men. Later studies indicate that the decisions of married women are the most sensitive, and their responsiveness grows with the size of their husband's earnings. *The responsiveness of single men exceeds that of married men.*" and page 56: ". . . *married claimants have greater* durations of disability payments. Their findings may suggest a greater willingness to file lost-time claims when there is another (actual or potential) income earned in the family."

WCRI [1991: CN], where a benefit change affecting only the highest 10% of wage earners had a large incentive effect).

3. *Older Employees:* Benefit level changes may induce older employees to use Workers' Compensation payments as "early retirement," for two reasons. First, older employees, with lower expenses, may be satisfied with disability benefits. Second, younger employees often desire regular employment, with its opportunities on promotions and advancement. Older employees, with little chance of additional work advancement, may be more content with disability payments (Gardner [1989], pages 60, 62).

Thus, the indirect effects of benefit level changes vary not only by type of injury but also by type of industry, based on the distribution of workers by age, income level, and primary versus secondary wage earners. The effects are strongest on low paying work with older employees who are secondary wage earners. The effects are weakest on high paying work with young, upwardly mobile, primary wage earners.

D. Non-Compensation Medical Benefits

Changes in non-compensation medical benefits in both public and private plans affect Workers' Compensation loss costs. For instance, a state may require that employer provided group health plans include a Health Maintenance Organization (HMO) option. Physicians employed by HMO's have an economic incentive to label injuries and diseases as "work-related." HMO physicians receive no benefit from non-occupational injuries, since they are compensated by salary for such cases. By deeming the injury or disease to be work related, they may bill the Workers' Compensation carrier directly (see Section 15).

Most group health plans have deductibles and coinsurance payments incurred by the employee. These create economic incentives for employees to consider their injuries or diseases as "work-related," since Workers' Compensation is a first dollar coverage with no employee contribution (Borba and Eisenberg-Haber [1988]). Adoption of "twenty-four" hour coverage, with similar medical benefits for occupational and non-occupational injuries and diseases, may shift some Workers' Compensation costs back to group health plans (Bateman [1991]; Bateman and

Veldman [1991].

Health actuaries, academics, and insurance research organizations have analyzed the effects of policy provisions and administrative procedures on containing medical care costs. Medical fee schedules and peer review are being used or considered in some states for Workers' Compensation.[39] The pricing actuary must quantify the likely effects of such enactments on Workers' Compensation loss costs.

E. Attorney Involvement

Workers' Compensation is intended to be a "no-fault" compensation system with little litigation or claim controversion. Attorney representation of Workers' Compensation claims has risen sharply in several states, with concomitant lengthening of disability durations and greater claim severities.

The AIRAC studies on Personal Automobile insurance suggest that attorneys cause greater "economic damages," by encouraging accident victims to stay out of work and incur large medical bills (AIRAC [1988; 1989], IRC [1990]). Similarly, Gardner [1989], page 2, finds that "incentives to remain away from work are even stronger when attorneys are negotiating [Workers' Compensation] settlements." Butler and Worrall [1985], page 719, using a multiple regression analysis, conclude that "when a lawyer represents a claimant the length of stay on Workers' Compensation will tend to increase . . . "[40]

Many states specify the reimbursement for plaintiff attorneys in Workers' Compensation cases. The 1991 Texas reform, which restricted payments for plaintiff attorneys, is expected to

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[39] Whether a state has a strong medical fee schedule affects the complement of the medical loss ratio trend in the NCCI procedure; see Section 8.

[40] This effect is greatest when the insurance compensation is assured, such as in Personal Injury Protection or Workers' Compensation. Under tort liability systems, claimants may be loath to incur large medical bills or income losses, since they may never be reimbursed.

reduce claim filings and claim severity (Gallagher [1990]).[41] Pricing actuaries must estimate the effects of the legislation affecting attorney involvement in insurance claims, to determine whether Workers' Compensation in particular states will be profitable.

F. Compensable Injuries and Diseases

The states vary in the statutory compensability of (i) latent diseases, (ii) diseases that are only partially work related, and (iii) stress claims. In California, for instance, stress claims are often deemed compensable and are becoming increasingly frequent (see Parry [1988], Barge [1988], Staten and Umbeck [1983], Victor [1988], Marcus [1988]).

Occupational disease claims and injuries treated by psychiatrists and psychologists have higher average severities than "traumatic" injuries (Marks [1984], Durban [1987]). Statutory amendments that encourage compensability of latent diseases and stress claims may have a great effect on overall loss costs.

Plaintiff attorneys often seek tort liability compensation for latent diseases, such as asbestosis (Millus [1987]). Workers' Compensation reimbursement generally requires physical disability and actual medical bills. Court awards under General Liability coverage are often obtained for a presumed increased likelihood of future disability or medical problems. In addition, class action suits are more common against General Liability carriers. Statutory changes that affect recoveries under tort liability will indirectly affect claim filings under Workers' Compensation.

G. Loss Cost Trends

Workers' Compensation loss cost trends and loss ratio trends are influenced by statutory amendments. Present rate making procedures adjust historical loss experience for the direct effects of statutory revisions. The indirect effects appear as part of the loss ratio trend (see Sections 8 and 17). If the historical indirect effects are included in trend factors, and indirect

[41] The Texas reform was declared unconstitutional by a lower court. It is now in the appellate court system, and it will presumably proceed to the state Supreme Court.

effects from current statutory revisions are estimated separately, one may double count these effects. If one ignores the indirect effects of current statutory revisions, one may underestimate the short term effects. If one adjusts historical statutory amendments for the indirect effects and removes the loss ratio trends, one may overlook economic or social influences on loss costs.

Most appropriate is a complete analysis of direct and indirect effects of historical and current statutory revisions, along with a residual loss ratio trend.

H. A Caveat

The effects of benefit changes on claim frequency and severity depend on many factors, such as present benefit levels, type of injury, and the administration of the compensation system. The economists studying these effects are careful to qualify their projections, to note the types of injuries and claimant populations to which they apply. Gardner [1989] provides a list of dozens of studies on each topic with the varying results they produced. Fein [1991: Financial Crisis], pages 25-26, and Gallagher [1990] note the difficulty of predicting the effects of the Texas Senate Bill 1 (effective January 1, 1991). Flat, didactic statements about incentive effects are simply misleading.

> *"It is well documented that a 20% increase in benefits results in a 7% increase in claims and a 4% increase in duration of such claims."* – DeCarlo and Minkowitz [1991], page 445.

Section 11: Involuntary Market Burdens

Workers' Compensation risks unable to obtain coverage in the voluntary market are insured in involuntary pools, or "residual markets." The pools in most states run operating deficits, which are funded by private insurance carriers in proportion to direct written premium. The pools now constitute about 23% of countrywide business, so the "involuntary market burden" is large. Pricing actuaries generally consider the involuntary market burden as an expense element in setting voluntary market rates (NCCI [1991], pp. 38-39; Gustavson and Treischmann [1985]; Fein [1991], page 20).[42]

The involuntary market burden is the operating loss of the pools, not the underwriting loss (White [1988], page 46). One may quantify the burden by discounting cash flows for involuntary market business, by combining voluntary and involuntary market cash flows in an Internal Rate of Return model, or by calculating an investment income offset factor. The actuary must also estimate the profit or loss from servicing involuntary market business (Littmann [1990]). For servicing carriers, the involuntary market burden is the net effect of the operating loss from pool business and the profit or loss from servicing involuntary risks.

The pricing actuary has several tasks with regard to the involuntary markets:

- *Profitability:* Understand the causes of pool size and pool deficit by jurisdiction, in order to estimate the expected profitability of Workers' Compensation business.

- *Pricing:* Calculate the residual market burden, which is used as an expense element in pricing voluntary risks.

- *Strategy:* Forecast the expected residual market burden for alternative Workers' Compensation programs, such as excess coverage or large dollar deductibles, in order to devise company strategy for future business.

[42] In some jurisdictions, risks that private insurers are unwilling to service can obtain coverage from a state fund, thereby obviating the need for an involuntary market.

A. *Profitability: Size of the Involuntary Markets*

There are several explanations for large involuntary insurance markets. All contribute to the involuntary market problem, but each implies a different solution.

Rate Adequacy

Rate inadequacies cause the line of business to be unprofitable or only marginally profitable. In the late 1980's, for instance, as Workers' Compensation profitability declined, the involuntary markets grew rapidly. Statewide rate increases would reduce the involuntary market share.[43]

Competition

Involuntary market rates are competitive with voluntary market rates. An involuntary market risk has no incentive to seek voluntary market coverage. Involuntary market surcharges would reduce the involuntary market share.[44]

The NCCI is attempting to mitigate this phenomenon, wherever state regulation permits:

> "[The residual market] does not, and should not, guarantee that such coverage will be at a price that is competitive or lower than in the voluntary market. To eliminate this

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[43] So Freeman [BRPC], page 22: "Why have so many residual market run amok? According to most observers, rate inadequacy heads the list of reasons"; see also Eisenberg and Vieweg [1987]. (McNamara [1984], page 15, gives the same explanation for automobile assigned risk plans: "The root cause of the availability problem is unquestionably the belief of underwriters that the overall rate levels, or the rates for particular classes and/or territories, are inadequate.") Note, however, that Workers' Compensation insurers continued using rate deviations and policyholder dividends averaging over 10% of premium through the 1980's. Voluntary risks would be profitable were there no involuntary market burden, even as the involuntary market grew. Higher manual rates may lead to increased deviations or dividends, not simply to reductions in the involuntary market share (though they have an effect).

[44] Huber [1986], page 54, provide an illustration: "In Maine, the regulatory disallowance of the plan managements's authority to mandate a retrospective rating plan for an account representing $4.3 million in premium resulted in the plan's forced provision of a substantially more competitive price than the voluntary market would provide. The same situation prevailed in Tennessee." Hofmann [1992: AR], page 9, notes that ". . . today's commercial insurance buyers know how to exploit bureau rates that are too low (by *voluntarily* purchasing coverage through assigned risk plans) . . ." Mintel [1983] sees competitive involuntary market rates as a major cause of the growth of certain Personal Automobile assigned risk plans.

possibility, NCCI has filed a plan change to recognize that an offer of any reasonable rating plan approved for use in a state would be considered an offer of voluntary coverage and failure to accept such an offer would exclude the risk from the residual market" (NCCI [1991: Issues report], page 38).

Hager [1991: Call for Reform; see also 1992; 1992], pages 2-3, lists five NCCI programs that should reduce the competitiveness of the pools, thereby depopulating them. The anticipated effects of such programs affect the actuary's forecast of the involuntary market load.

- Higher deposit premium requirements for involuntary risks.
- Payroll verification plans to avoid willful understatement of payrolls.
- Elimination of premium discounts for involuntary risks.
- Premium rate differentials between the involuntary and voluntary markets, ranging up to 25%.
- Two loss sensitive experience rating plans designed for involuntary risks: the Assigned Risk Adjustment Program (ARAP) and the Assigned Risk Rating Program (ARRP), which reflect more closely adverse historical experience.

Classification Refinement

Over-simplified risk classification schemes do not allow insurers to charge different rates to risks of different quality. Risks of poor quality that are not surcharged end up in involuntary markets. More accurate risk classification schemes would reduce the involuntary market share (Brunner [1985]).

Classification inefficiency in competitive markets is often used to explain large automobile involuntary markets. [Massachusetts, for instance, does not allow classification by sex, limits classification by territory, and has an involuntary market facility that insures over half the Personal Auto risks.] This explanation is particularly appropriate for Workers' Compensation, which had a rapid spread of "open competition" in the late 1980's, but retains a simple classification scheme.

Insurance Expenses

Some underwriting and administrative expenses vary more directly with the number of policies than with premium. An expense loading proportional to written premium assigns too little expenses to small risks, and the expense constants are insufficient to cover these "per policy" costs. As a result, small risks are often unable to obtain coverage from voluntary carriers and end up in the residual market.[45] Larger expense loadings for small risks would reduce the involuntary market share.

B. Pricing: Calculating the Burden

Residual market assessments vary with voluntary market writings. Thus, the operating loss on involuntary market risks may be considered an expense for voluntary market risks. To calculate the "residual market burden," the pricing actuary determines the net loss after investment income for involuntary market risks and divides this amount by voluntary market premium. There are several ways of doing this.

Investment Income Offset

The NCCI provides combined ratios by state for the involuntary market pools. An "investment income offset" is derived from Insurance Expense Exhibit data as line 11 ("Net Investment Income Gain or Loss") divided by line 2 ("Net Premiums Earned") for column 16 ("Workers'

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[45] Compare Chelius and Smith [1986], page 5: "If small businesses are not regarded as desirable clients, one can conclude that their possibly higher premiums per dollar of loss reflect higher overhead costs that are not fully recouped by insurance companies because of rigidities in the ratemaking process." They note that "small businesses are consistently and heavily over-represented in both assigned risk pools and competitive state funds. For example, the average premium paid in 1983 by those firms obtaining insurance from assigned risk pools was $1,812, while the average premium written by stock insurance companies in that same year was about $5,000" (pages 5-6). So also Huber [1986], page 52: "A review of the 20 most populous classes of the NCCI-managed reinsurance pools tells us that most accounts are small . . ." Compare also Freeman [BRPC], page 110: ". . . in workers comp . . . the carriers left in a particular market may have minimum premiums which are so excessive that smaller insureds are forced into the residual market." The NCCI, however, contests these observations: "In 1990, NCCI performed studies which refuted some common misconceptions concerning the demographics of the residual market. Although small risks account for approximately 75 percent of the residual market, they account for approximately that same percentage of the voluntary market" (NCCI [1991: Issues report], page 37). So also White [1988], page 39: "The composition of the residual market by size of insured does not differ significantly from the voluntary market except on the very high end of accounts in the million dollar range" and Fein [1990: Pricing and Profitability], page 31.

Compensation"). Industry-wide figures for 1990 give $4,172 million / $30,812 million, or 13.5% (Best's [1991: A&A]).

There are several problems with this calculation:

- The Net Investment Gain or Loss in the IEE allocated to lines of business excludes capital gains and losses, which are allocated entirely to the Capital and Surplus Account (IEE, Part II, line 11 instructions, footnote A). The 13.5% figure should be increased, perhaps by including capital gains and losses in the allocation of investment income.

- The timing of premium and loss cash flows differs between the voluntary and involuntary markets. Involuntary risks are written by servicing carriers; other member companies are charged assessments. Involuntary premiums are collected earlier, since retrospective rating plans are not used and required premium deposits are often larger than in the voluntary market. The IEE investment income offset, which is based on net loss reserves and unearned premium reserves, reflects the cash flows of all business, most of which is voluntary.

- The IEE investment income offset is based on the investment income received in the current calendar year, not the investment income expected in the future for the current policy year. The offset is distorted by changes in business growth and market interest rates (Butsic [1990]; Bingham [1992]).

- The investment income offset differs by state, since benefit provisions and loss payment patterns differ by state (see Section 7 above).

Discounted Cash Flows

Premium collections and loss payments may be discounted to the policy inception date to determine the economic loss from involuntary market risks. The premium collection and loss payment patterns should be those of the given state's involuntary market.

This approach can be used by both servicing carriers and other member companies. The servicing carrier would consider premium, loss, and expense transactions with both the policyholder and the pool. Other insurers would consider only premium and loss transactions with the pool.

Pricing considerations include:

- *Data Availability:* Some insurers do not keep the necessary records of cash flows to and from the pools by policy year, though industry statistics are compiled by the NCCI.

- *Complexity:* If the insurer does not use financial pricing models for its voluntary risks, the modeling work required may be great.

- *Discount Rate:* The actuary may select a conservative, risk free rate (e.g., Treasury bills), or an expected new money investment rate (e.g., high quality corporate bonds). Since all other values in the rate review are on a pre-tax basis, a pre-tax discount rate should be used.

Involuntary Load Illustration

There are no set procedures for calculation the involuntary market load; current methods differ by carrier and by jurisdiction. The pricing actuary must estimate

- The operating loss of the pool during the future policy period, and
- The market share of the pool during the future policy period.

Historical loss ratios for involuntary business may be obtained from the bureau managing the pool. The operating loss is either

- The undiscounted loss ratio plus an expense ratio (servicing carrier allowance) minus the investment income offset, or
- The discounted loss ratio plus an expense ratio.

For instance, the undiscounted loss ratio may be 110%, the servicing carriers allowance may be 30%, and the investment income offset may be 20%, for an operating loss of 20%.

The future market share of the pool may be estimated as the most recent market share adjusted for the anticipated effects of residual market programs. For instance, higher premium deposit amounts and the lack of premium discounts may encourage more large risks to seek coverage in the voluntary market, thereby reducing the involuntary market burden.[46] Other developments also affect the anticipated market share of the pool. For instance, factors that increase the share include

- risks leaving the voluntary market for self-insurance plans or excess coverage, and
- regulatory suppression of voluntary market rates, leading insurers to tighten underwriting restrictions.[47]

For instance, the most recent market share of the pool may be 18%, a new involuntary market experience rating plan is expected to reduce this 2 points, and the exodus of risks from the voluntary market to self-insurance and excess coverage is expected to increase this 4 points, for a projected future involuntary market share of 20%.

The market share of the involuntary pool is converted into a ratio of involuntary to voluntary premium. For instance, a 20% involuntary market share is a 25% ratio of involuntary to voluntary premium.

The involuntary market burden is the product of the pool operating loss and the ratio of involuntary to voluntary premium. Thus, a 20% operating loss times a 25% ratio of

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[46] Fein [1990: Enduring Difficult Times], page 5, estimates that "the residual market programs have reduced the burden on the voluntary market by two percentage points." Some of these programs, such as rate differentials, reduce both the involuntary market share the involuntary operating loss.

[47] In addition, not all voluntary premium is included in the residual market assessment base. For instance, carriers taking direct assignments from the pools may not receive an assessment. Countrywide, the assessment base is about 96% of the voluntary market premium, though this varies by jurisdiction (NCCI [1992: Act-92-4], Exhibit 10–2–I). The pricing actuary must also consider the effects of business growth or contraction, since direct written premium of the preceding calendar year is the assessment base for the current policy year.

involuntary to voluntary premium is a 5 point involuntary market burden.[48]

C. Strategy: Forecasting the Burden

Large involuntary market burdens are forcing insurers to leave some jurisdictions or to develop alternative insurance programs. Much insurance for large risks at lower layers of coverage is "dollar trading": the insure collects premium which it return in loss payments. Some of these expenses are a servicing charge for issuing policies and handling claims.

Alternative Workers' Compensation programs

In a jurisdiction with a large involuntary market burden, this servicing charge rises, and full coverage programs may become uneconomical. To alleviate the burden, some insurers are developing alternative programs, such as excess coverage, administrative services only (or management assistance for a self-insurance program), and large dollar deductible policies. State regulations affect the types of programs offered in each jurisdiction.

As an example, suppose an insurer has a 3% market share in a jurisdiction with a 15% involuntary market burden. Its voluntary market operating ratio is 90%, but with the involuntary market burden, its net operating ratio is 105%.

A conversion to excess coverage, by means of an assisted self-insurance program or a high deductible in the policy, with a two thirds reduction in premium, may cause the following:

- Market share drops to 1%, since premium is only one third as large.
- The insurer continues to handle all claims. The insured pays the benefit costs, and the insurer pays the loss adjustment costs. Most of the premium in some excess plans is for claims handling expenses.
- The insurer uses a larger percentage "profit and contingencies" provision to

[48] Actual loads vary greatly state. The NCCI estimates a countrywide average of nearly 15%, though estimates by private carriers vary considerably. Jurisdictions with high involuntary market shares, such as Arizona, Florida, Kentucky, Maine, Massachusetts, and Tennessee, require large involuntary market loads, ranging from 25 to 40%. The full indicated load is not always permitted by state regulators.

accommodate the variability in the higher layers of coverage. Although the percentage provision is higher, the dollar amount is lower, since the total premium is lower. Thus, the insured's premium plus the self-funded benefit costs are lower than the premium under the full coverage policy.

- The larger percentage profit provision causes the voluntary market operating ratio to drop to 80%. With the involuntary market burden, the net operating ratio is 95%.

In sum, the cost to the insured is lower, the claims operations remain essentially unchanged, and the insurer's profitability rises.

The pricing actuary's task is complex. He or she must

- Forecast industry changes to alternative programs. If all companies switch to excess coverage in the voluntary market, the involuntary market burden increases as a percentage figure and remains constant as a dollar amount.
- Develop pricing techniques for excess layers of coverage. Workers' Compensation does not use increased limits factors. Instead, the actuary may use excess loss pricing factors from retrospective rating techniques (cf. Simon [1965]).
- Determine the appropriate profit provision for the greater variability in excess layers of coverage (cf. Miccolis [1977]).
- Quantify the anticipated effects of newly implemented involuntary market programs.

Section 12: Large vs. Small Risks

". . . the small risk does not have the same incentive to provide for efficient and extensive accident prevention work, first, because such work requires an expenditure of money and second, because it does not reduce the cost of insurance. Furthermore, it must be borne in mind that many small employers do not keep accurate and adequate payroll records and, in certain industries, are tempted to conceal and do conceal considerable portions of the payrolls actually expended. . . . The problem of premium collection is also very acute in case of a small risk where frequent changes of the insurable interests, disappearance of the assured, reluctance to pay additional premium upon audit and other similar conditions, make it well nigh impossible to collect the full premiums due. On the other hand, the expenses of handling the records of the books of the company and of preparing reports to various boards, bureaus and supervisory authorities are percentage-wise considerably higher for those risks than for risks with substantial premium volume." – Kormes [1936], page 46.

Small risks have higher average loss ratios and higher average expense ratios than large risks have. Expense constants, loss constants, premium discounts, and experience rating plans recognize these differences. This section discusses the reasons for these differences and some ratemaking techniques that adjust for them.

A. Expenses

Some underwriting expenses, such as setting up files, do not vary much by size of policy. The proportional expense loading used in Workers' Compensation ratemaking assumes that expenses are directly proportional to premium, thereby undercharging the small risk and overcharging the large risk. If no other expense component were incorporated in pricing, small risks would be unprofitable and may have difficulty obtaining coverage (Barber [1934]).

A flat "expense constant" is added to each risk's premium. The amount varies by jurisdiction and must be adjusted for inflation (Chelius and Smith [1986]). The NCCI is now using $140 in

most states, though the size of the expense charge depends on regulatory approval.[49]

Expense Constants and Expense Ratios

Certain ratemaking adjustments are applicable to manual premium, not to the expense constant premium. For instance, the "on-level" procedure determines how much premium would have been collected had the policies been issued at the current rates. Rate revisions affect the manual rates, not necessarily the expense constant. The expense constant premium applicable in each year must therefore be removed at the beginning of the on-level procedure, and the current expense constant must be added at the end (cf. Kallop [1975]).

Premiums derived by extending exposures from Unit Statistical Plan data do not include expense constants. Premiums derived from financial data include the expense constants. In the past, when the expense constant differed by size of risk, removing the expense constant premium required a distribution of risks by size (cf. McConnell [1952], page 31; Marshall [1954]; Kallop [1975]). Now that the expense constant is uniform for all risks, removing the expense constant premium requires only a policy count.

Expense ratios derived from IEE data include expense constants. To avoid double counting, the pricing actuary must remove the expense constant premium from the expense loading. For instance, suppose the insurer's book of business shows

net written premium:	$45 million
average premium discount:	10%
number of policies:	2,000
expense constant:	$150 per policy

Standard premium is $45 million ÷ 0.9 = $50 million. Total expense constant premium is 2,000 × $150 = $300,000. The proportional expense loading (for general expense and other

[49] Originally, the expense constant was used only for small risks: "The loss and expense constants applied to risks producing annual premiums of less than $400 prior to July 1, 1934 and to risks producing annual premiums of less than $500 on and after July 1, 1934" (Hipp [1936], page 258). In reply, Kormes [1936], page 267, notes that ". . . the author feels that an expense constant is not necessarily attributable to small risks since if it is based on the theory that there are certain constant expenses per policy it should, in practical application, be charged as a sort of a policy fee on all risks." Marshall [1954], pages 20-21, and Kallop [1975], page 65, retain the expense constant as a charge only for small risks. Eventually, the difficulty of publicly justifying this procedure led to the present application to all policies.

acquisition costs) must therefore be reduced by $300,000 ÷ $50,000,000 = 0.6%.

The determination of the expense constant poses special problems in a loss cost environment. Many "fixed expenses," such as advertising, overhead administrative costs, and underwriting salaries, are not easily allocated to policies or premiums. It is unclear whether bureaus will continue to provide advisory expense constants in most jurisdictions, or whether company actuaries must independently select the constants.[50]

B. Losses

Loss experience is generally better on large risks than on small risks. This is evident in various ways:

- The experience rating plan generally shows a higher ratio of credit to debits for large risks than for small risks (cf. Dorweiler [1934]).
- Small risks are more likely to be assigned to involuntary markets than large risks are (Chelius and Smith [1986]; Huber [1986]).
- Independent studies of experience by premium size generally show higher loss ratios for small risks than for large risks.[51]

Two explanations of this phenomenon are often given:

- The experience rating plan does not just measure loss experience; it provides an incentive for safety procedures. Poor loss experience for a firm subject to an experience rating plan increases the cost of insurance in future years; conversely for good loss experience decreases the future cost of insurance. The more weight that is given to a firm's own experience, the greater is the employer's incentive to reduce claim costs. Since the experience of large firms receives greater credibility than the experience of small firms,

[50] Most general expenses do not vary by state. Presumably, expense constants determined for administered pricing states are reasonable for loss cost jurisdictions as well.

[51] Chelius and Smith [1986], however, find that the ratio of premiums to losses is slightly higher for small risks than for medium sized risks, suggesting that small risks have slightly better loss experience than average. Cf. also Harrington [1988].

large firms have greater incentives to reduce losses.[52]

- Safety programs require large fixed costs: installing guards on machines, replacing dangerous equipment, implementing safety programs, and hiring on-site medical personnel. The large expenditures required may be more cost-effective for large firms than for small firms.[53]

Loss Constants

Loss constants, or flat dollar premium additions either for all insureds or for small insureds, are a means of flattening the loss ratios by size of risk. Loss constants were once a standard component of the Workers' Compensation premium. They were applied only to risks below a certain size, and they varied by industry group and jurisdiction. Loss constants have been dropped in most states. In 1990, the NCCI recommended that loss constants be reinstituted in those states whose experience indicated a need. To avoid any appearance of unfair discrimination or rate redundancy, "the loss constant would be applied to all risks with a concurrent rate offset to make the program revenue-neutral" (NCCI memorandum AC-90-23).[54]

The calculation of the loss constant is illustrated below for two scenarios: one in which the loss constant is applied only to risks with annual premium less than $1,000, and one in which the loss constant is applied to all risks.

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[52] Opinions differ as to whether experience rating actually provides such an incentive effect and how great this effect is, particularly compared with the incentive effects of self-insurance. For a variety of studies, see Victor [1982; 1985]; Victor, Cohen, and Phelps [1982]; Chelius [1982; 1983]; Chelius and Smith [1983]; Ruser [1985]; Worrall and Butler [1988].

[53] Cf. Hipp [1936], page 259: "It may be that small risks are inherently more hazardous than large risks. Regardless of expense, small risks may not be readily susceptible to accident prevention methods." Cf. also Perkins [1922], pages 273-274.

Gary Venter has pointed out to me that "large and small risks may differ in off-the-books payroll that is only reported after an injury." In other words, payroll may be understated for small firms, so expense and loss ratios may be higher.

[54] The NCCI recommendation has not yet been implemented. Texas has retained its loss constant applicable to small risks only. The Delaware Compensation Rating Bureau (Circular No. 661) adopted a $45 loss constant, effective in May 1992, applicable to all risks. Loss cost systems may stimulate increasing diversity among carriers and jurisdictions.

Loss Constants Applied to Small Risks Only

Suppose the historical experience is as shown below.

Calculation of Loss Constants

Premium Range	Number Of Risks	Earned Premium	Incurred Losses	Loss Ratio	Loss Constant	Loss Cost Premium	Loss Ratio
$0 – $1,000	500	$ 300,000	$240,000	80%	$40	$20,000	75%
> $1,000	500	2,000,000	1,500,000	75	0	0	75

Loss constants will be used for risks with annual premium of $1,000 or less. Observed experience for these risks shows premium of $300,000 and incurred losses of $240,000, for a loss ratio of 80%. For risks with annual premium greater than $1,000, the total premium is $2,000,000 and incurred losses are $1,500,000, for a loss ratio of 75%. There are 500 risks in each group.

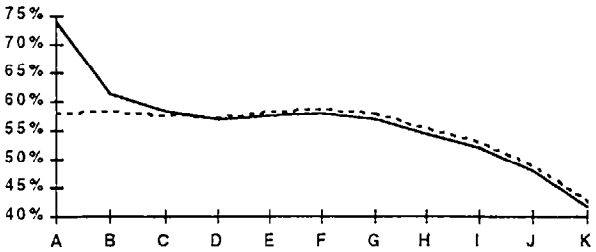
The loss constant is chosen such that the new loss ratio for risks with annual premiums of $1,000 or less becomes 75%. Since the incurred losses are $240,000, the premium must be $320,000 to produce a loss ratio of 75%. That is, an additional "loss constant" premium of $20,000 is needed. Since there are 500 risks, the loss constant must be $40.

The loss constant premium must be offset in the manual rate premium. Thus, the manual rate must be reduced by $20,000 ÷ $2,300,000, or 0.87%. Each group would have a loss ratio of 75.6% [= 75% ÷ (1 – 0.0087)].

Loss Constants Applied to All Risks

The NCCI used countrywide Unit Statistical Plan experience for 1988 through 1990 to calculate loss constants by state (NCCI memorandum Act-90-23). The experience showed steadily declining loss ratios to standard earned premium as the risk size increased, as shown by the solid line below. Use of a loss constant for all risks flattens the loss ratios for smaller risks, as shown by the dotted line.

The countrywide average indicated loss constant is $104, though this figures differs markedly by state. With an offsetting premium rate reduction of 1.78%, the average indicated loss constant is $102.15.



There are eleven premium sizes, ranging from $0 – $999 ("A") to $1 million and up ("K"). Note that the loss constants flatten the high loss ratios for small risks, but have little effect on the low loss ratios for large risks.

The pricing actuary should understand the causes of differing loss experience by size of risk. Those relating to sunk costs may be remedied by expense constants; those relating to economic incentives for safety programs may be remedied in part by varying the experience rating plan; those relating to economies of scale for safety programs can sometimes by remedied by loss control efforts provided by the insurer and by loss constants. The goal is to minimize the expected accident costs and to set a premium rate that reflects these costs.

Section 14: Classification Systems

"But the uninitiated are scarcely prepared to learn that the hazard of digging a six-foot trench and laying the pipe therein is doubled if sewage rather than water is to flow through the trench . . ."

– Downey [1915], page 12

The previous sections describe the pricing procedures for overall statewide rate revisions. But insureds are not charged "overall statewide rates." Since the risk of injury varies among insureds – for instance, miners face greater occupational hazards than retail clerks do – manual rates vary accordingly. Risk classification is the means of differentiating among insureds and aligning the premium charged with the risk of loss.

A. Industry Group and Occupation

Risk classification systems may be multidimensional or unidimensional. Personal automobile insurance uses a multidimensional system. Risks are classified by driver characteristics, use of the vehicle, territory, and driving history. Although each dimension by itself has limited explanatory power, they measure different influences on loss cost (SRI [1979]). The combination of the classification variables improves the power of the risk assessment system.

Workers' Compensation has a unidimensional classification system. Insureds are divided into three industry groups: manufacturing, contracting, and all other. Each industry group is then subdivided into classifications based on the products manufactured or the services provided. For example, the manufacturing industry group contains classifications for jewelry manufacturing, motorcycle manufacturing, and refrigerator manufacturing (see, for instance, Mowbray [1921]; NCCI [1989: Class Manual]).

Occupational injuries and diseases are related to industrial processes and operations, not necessarily to products and services. Welders face greater hazards than accountants, regardless of the industry in which they work. Some actuaries have suggested that the classification

system should discriminate by occupation, not by industry.[59]

Classification by occupation entails verification problems: How many employees are welders? How many are accountants? The present Workers' Compensation classification system uses product as a *proxy* for occupation. Producers of the same product are assumed to use similar manufacturing processes, so the product produced is a rough measure of workplace hazards.[60] [Certain employees, however, such as clerical workers, draftsmen, salespersons, and drivers, are termed "standard exceptions" and are separately classified.]

This unidimensional classification system is relatively inefficient, particularly in comparison to automobile insurance classification. However, the manual rate is adjusted by a mandatory

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59 Downey [1915] perceives the industry classification system as flawed (page 10: "The existing 'casualty' insurance classification of industries is a relict of employers' liability. . . . it is not adapted to the broader needs of compensation insurance; it is a thing of shreds and patches; it was never conceived as a whole nor based upon any reasoned principle of taxonomy"), and he presents forceful arguments for classification by occupation. The closer relationship of occupational hazard to occupation than to industry is mentioned in the text. Downey also notes that competition compels insurer to continuously refine the industry classification system until the individual classes are too small for credible rate making. Since there are far fewer industrial processes than industrial products, classification by occupation leads to more accurate pricing.

Downey has a jaundiced view of competition: "Whatever may be true of competition in service, or even in rates, competition in misclassification is an unmixed evil" (page 23). Actuarial equity in classification is similarly of little concern: "That every commodity shall bear its specific accident cost . . . is neither practically attainable nor especially important." The countervailing argument is that the industry classification system in Workers' Compensation was feasible only because of the administered pricing system and the lack of open competition.

In his discussion of Downey's paper, Gustav Michaelbacher [1915] gives a vigorous defense of classification by industry. In particular, he argues that classification by occupation would reduce safety incentives for the employer, since the rate for each occupation would be based on a diverse set of firms: "Dr. Downey's plan, if put into practical application without any modification whatsoever, would largely do away with the 'Safety First' movement. If employers were to find their establishments divided by processes and grouped for insurance purposes with a resulting rate covering all of the risks in a given class, they would not be particularly interested in making their individual plant as safe as possible, for they would feel somehow that they were being assessed for accidents occurring in processes carried on in the worst possible manner and would consequently have no incentive to make their own plant as safe as it possibly could be made" (page 30). This argument seems specious. Classification by occupation would provide incentives to eliminate the more dangerous processes and operations and would thereby reduce the overall injury rate.

60 Kallop [1975], page 83: "The fundamental concept underlying workers' compensation ratemaking and pricing is that the exposure to risk of each employer is in part a function of the business in which he is engaged. Because it is expected that each employer engaged in the same type of business would have a similar distribution of employees performing comparable functions, it follows that a single all-inclusive classification is the most practical method of determining premium." Downey [1915], page 16, takes the opposite view: "The number and character of operations, and consequently the kind and degree of hazard, differ widely as between establishments turning out the same finished product." On the practical issues, see also Black [1915], page 27: "The principle objection to process classification is the impossibility of determining the actual payrolls expended on the different processes."

experience rating plan as well as by voluntary schedule rating and retrospective rating plans. The importance of the individual risk rating plans stems from both (i) the stability of injury experience by firm and (ii) the inefficiency of the manual classification system.

B. Other Classification Dimensions

Several other classification dimensions are powerful predictors of Workers' Compensation loss costs. Important variables are

- workforce characteristics, such as age and sex,
- group health benefits provided by the employer,
- territory and claims consciousness, and
- the financial health of the employer and of its industry.

As open competition spreads in Workers' Compensation and carriers seek strategic advantages, classification systems will be refined.[61] The predictive power of the classification variable is the primary determinant of its usefulness. In addition, the actuary must consider issues of (i) data availability, (ii) quantification, and (iii) social acceptance of each classification variable (AAA [1990]). For instance,

- data on personal characteristics of the workforce are not now gathered by Workers' Compensation insurers, though health and disability insurers use these attributes;
- the influences of group health benefits on Workers' Compensation costs are difficult to quantify despite their importance, because employer provided group health plan provisions are so varied;
- rating by territory raises social acceptability issues, even more in Workers' Compensation than in Personal Automobile (see Section 14.E).

Rating bureaus are concerned that a proliferation of classification systems will impair the integrity of industry-wide data bases and hamper the application of a mandatory experience rating plan (AIA [1982]; Berquist, et al. [1991]). Conversely, some private insurers believe

[61] See McNamara [1984] for the relationship of price competition and classification refinement. Cf. also Pomeroy [1990], page 26, who notes the NAIC project goal of determining whether Workers' Compensation classifications are appropriate.

that adherence to a uniform classification system and the use of a mandatory experience rating plan are impediments to true open competition (see Hofmann [1992] for a general discussion). This reading takes no position in this debate. It simply notes that underwriters, agents, and private carriers examine various risk characteristics when offering Workers' Compensation coverage. The pricing actuary must be able to quantify their effects to use them effectively in an open competition environment.

C. Workforce attributes

The distribution by age and sex of the workforce affects the expected medical and disability benefits. These distributions have long been used by health insurance actuaries for premium determination in employer provided group plans. Since many of the relationships between personal characteristics and health benefits stem from non-occupational illnesses, such as gynecological treatment for young women or cardiovascular illnesses for older individuals, the health insurance studies must be adjusted for pricing Workers' Compensation policies.

This section focuses on age, whose relationship to Workers' Compensation benefits is clear. In particular, we examine age in relationship with claim frequency, claim severity, and experience rating plan modifications.

Health care costs for *non-occupational illness* rise steeply with age, so employer provided health plans for small groups depend on the age distribution of the workforce. *Occupational injuries* are more frequent among inexperienced workers, who are generally young.[62] Durations of disability for a given injury are longer for older workers, primarily for physiological reasons but also because workers near retirement may use compensable

[62] So Worrall, Appel, and Butler [1987, NCCI Digest], pages 7-8: ". . . younger workers are far more likely to be workers compensation claimants." The frequency of occupational *diseases*, however, often depends on the length of the exposure period. The longer an employee has worked, the greater is his or her exposure to toxic substances. Thus, disease frequency is higher for older workers, who have had more exposure.

disabilities as substitutes for early retirement.[63] Dillingham [1983], page 238, presents the following Workers' Compensation claim frequency and severity figures for New York indemnity cases in 1970:

Average Claim Frequency and Severities
New York Workers' Compensation Indemnity Cases, 1970

Age Group	Claim Frequency Per 500 Workers	Average Claim Severity	Average Loss Costs
Less than 25 Years	13.83	$ 753	$10,414
25-44 Years	9.28	1,385	12,853
45 Years & Older	9.20	1,798	16,542

One can sometimes rely on the experience rating plan to mitigate rate inequities. But this rating plan does not substitute for classification by workforce attributes, for two reasons.

- The experience rating plan has less effect on small and medium sized risks, where the age distributions of the workforce vary considerably.
- The experience rating plan aggravates the problem of varying age distributions. A small firm with many older workers will have high expected loss costs but low expected frequency. Since the experience rating plan emphasizes claim frequency, not claim severity, it may indicate a credit, not a debit. Conversely, a small firm with many young workers will have low expected loss costs but high expected frequency, and it may receive an experience rating debit instead of a credit.[64]

[63] So Worrall, Appel, and Butler [1987: NCCI Digest], page 9: "Age significantly increases the costs of medical utilization . . ." The effects on indemnity benefits are equally great. Butler and Worrall [1985], page 719, restate the "retirement" cause in more formal terms: "Since the older one is, the shorter the subsequent stream of wages upon returning to work, one would expect age to decrease the hazard rate." Their regression analysis supports this hypothesis.

As Dave Appel has pointed out to me, one must consider the effects of age on premiums as well. Older workers generally are more senior and higher paid. Their higher average loss costs may be offset by the greater payroll.

[64] The claim severity disparity between younger and older workers is most evident in serious cases. The experience rating plan divides losses into primary and excess portions, with a low cutoff point for small firms (Venter [1987]; Gillam [1991]).

D. Group health benefits

During the late 1980's, many employers increased deductibles and coinsurance payments for group health insurance plans. Workers' Compensation remains a first dollar coverage: medical losses are reimbursed in full, with no deductibles or coinsurance payments. Some accident victims file for Workers' Compensation benefits even when the injuries are not necessarily work related.[65]

Medical care practitioners have similar economic incentives to label injuries "work-related" and therefore compensable. Physicians in HMO's, for instance, receive no additional compensation for an injury or illness covered by group health plans but full reimbursements for injuries or illnesses covered by Workers' Compensation. Similarly, chiropractic treatments are covered under Workers' Compensation but may be excluded under certain group health plans.

A firm with a generous group health care plan, such as a fee for service plan with low deductibles and co-payments, will have low expected Workers' Compensation costs. Conversely, a plan with high deductibles or co-payments, or a plan emphasizing Health Maintenance Organizations or Preferred Provider Associations, may have high expected WC costs. Ducatman [1987], page 52, presents data for eight federal shipyards showing a strong correlation between the percentage of workers enrolled in HMO's and the average Workers' Compensation costs per capita. He concludes that "increases in present prepaid plan enrollments were accompanied by substantial increases in workers' compensation costs."

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[65] Ducatman [1987], page 51, summarizes this: "When individuals have access to parallel health insurance systems, they can be relied upon to use them advantageously. When one system [group health] severely constrains costs and services, and the other [Workers' Compensation] provides full access to health services without additional cost, the unconstrained system will predictably prove more popular." Hager [1991], page 9, writes: ". . . medical inflation within the workers compensation system has been running 50 percent higher than general medical inflation. . . . because compensation is the last medical insurance system that generally prohibits deductibles and coinsurance, provides for unlimited medical benefits, and makes it difficult for insurers and employers to use HMO- and PPO-type mechanisms." Borba and Eisenberg-Haber [1988] find that Workers' Compensation claims for sprains and strains (soft tissue injuries) are more common on Mondays than on other days of the week, suggesting that non-occupational injuries occurring on weekends are being reimbursed by the Workers' Compensation system. They note that "there may be economic incentives for a worker to attribute an off-the-job injury to a workplace incident. In particular, medical expense reimbursement and indemnity benefits for lost work time may be more complete under workers compensation insurance than under accident and health plans" (page 52).

HMO Enrollment and Workers Compensation Costs, Fiscal 1983

Shipyard	% HMO Enrollment	WC Costs Per Capita	Shipyard	% HMO Enrollment	WC Costs Per Capita
A	0%	$ 347	E	53%	$ 756
B	0	370	F	53	930
C	<1	477	G	83	1,181
D	39	723	H	66	2,325

The type of group health insurance plan provided by the employer, as well as changes in the group health plan provisions, must be considered by the actuary when pricing Workers' Compensation policies. Because of the variety of group health plans and the constantly evolving nature of many provisions, an objective classification scheme may be difficult to devise. Rather, the Workers Compensation actuary must understand the qualitative influences on benefit costs and provide rough estimates of their magnitude.

E. Territory

In Personal Automobile insurance, territory is a powerful classification dimension. In the past, many actuaries presumed that traffic congestion, road conditions, and similar "physical" factors were the major influences on loss cost differences by territory. Recent studies have suggested that equally important factors are attorney involvement in insurance compensation systems and *differing proclivities to file personal injury claims. For example, the AIRAC attorney* involvement studies showed that claim severity was higher in urban areas than in rural areas – not because of differences in economic damages per claim (which are higher in rural areas) but because of the greater percentage of urban claims that are represented by attorneys (AIRAC [1988; 1989]). *Similarly, the "BI/PD ratio" studies showed that the incidence of physical* accidents was more similar across territories than the incidence or severity of Bodily Injury claims (IRC [1990]; Woll [1991]).

Workers' Compensation is a no-fault coverage, abrogating the employee's right to sue in exchange for statutory benefits. Yet attorney involvement in compensation claims is increasing rapidly, along with total benefit costs (Borba [1989], page 67). The effects of the trial bar are

evident in three areas:

Claim Frequency

Many compensation claims, such as some soft-tissue injuries, stress claims, and disease claims, are of dubious validity. Oftentimes, a worker suffering from stress, moderate hearing loss, or a minor back sprain will press a compensation claim only if encouraged by an attorney.

The relationship between physical injury and insurance claim is clearest in the BI/PD studies undertaken by the Insurance Research Council [1990]. Personal Auto Property Damage (PD) claims depend primarily on physical accidents; Bodily Injury (BI) claims depend on the injured party's claims consciousness and on attorney involvement as well. The ratio of BI claims to PD claims measures the proclivity of the public to press insurance claims.

The Personal Automobile BI/PD ratio by territory is a good predictor not only of Auto loss costs but also of Workers' Compensation benefit costs. Exhibit 15.E.1 shows Insurance Service Office BI/PD ratios by Personal Auto rating territory in Florida, and Exhibit 15.E.2 shows attorneys per capita in each Florida county. Lawyers are more concentrated in the southern half of the state (e.g., Dade, Palm Beach, and Polk counties) than in the northern half (e.g., Jackson county). Similarly, the BI/PD ratios are higher in the southern territories than in the northern ones. Finally, both automobile loss costs and Workers' Compensation benefit costs are greater in the southern half of Florida than in the northern half.

Economic Damages

Attorneys raise claim costs not only by persuasive arguments in litigated cases but also by "building up" the economic damages. The All-Industry Research Advisory Council, in its 1989 study of Automobile personal injury claims, compared claims where an attorney represented the plaintiff with claims where the victim sought compensation without legal aid. The ratio of insurance payments to physical damages, about 2 to 1, was the same for each group. But the attorney-represented claimants had two to three times the average costs for medical treatment

and lost workdays that the non-represented claimants had.[66]

Plaintiffs' lawyers are paid on a contingency fee basis. The greater the damages, the larger the award; the larger the award, the higher the attorney's fees. Many lawyers encourage claimants to seek repetitive medical treatment and to refrain from work. This incentive to aggravate claims is unrelated to the type of compensation system, whether liability or no-fault, Personal Automobile or Workers' Compensation. As long as the award varies with damages, the attorney benefits from increased loss costs.[67]

Medical Treatment

The type of medical treatment received by the claimant influences both economic damages and insurance compensation. Medical practitioners who deal with injuries that are difficult to objectively assess, such as psychologists, physical therapists, and chiropractors, may sometimes provide treatment primarily to collect the insurance compensation. Geographical location is often correlated with such phenomena. For instance, 1989 Personal Auto insurance claims in Lawrence, Massachusetts, were predominantly sprains and strains, treated by chiropractors, often represented by the same group of attorneys, with unusually little variance in the length of treatment or the claim medical charges – symptoms of potential fraud (Weisberg and Derrig [1991]; Marter and Weisberg [1991]). Similarly, Workers' Compensation stress claims are far more common in certain regions of California than in other areas, whether because of judicial liberality or psychological positions (Borba [1989], page 63).

In sum, territory is an important classification dimension because of social differences by region. (The use of territory is more difficult for Workers' Compensation rating than for

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[66] An alternative explanation is that claimants are more likely to seek legal aid in severe cases. However, the same relationships appear even when claims are stratified by type of injury (AIRAC [1989]).

[67] Butler and Worrall [1985], page 719, note that "when a lawyer represents a claimant, the length of stay on Workers' Compensation will tend to increase, since the transition rate from Workers' Compensation decreases." Similarly, NCCI [1991: issues report], page 35, attributes the increasing paid loss link ratios to greater attorney involvement in Workers' Compensation claims. Attorney involvement also increases defense fees. Pillsbury [1992] estimates that "litigation costs [in California] accounted for more than $1 billion our of $6 billion in total workers' compensation costs in1988."

automobile rating because some risks have multiple plants. However, this is no different from multi-state risks, which the rate making procedures accommodate.) The actuary must understand these influences on Workers' Compensation costs and incorporate them into pricing and marketing strategy.

F. Financial Health

Economic conditions affect Workers' Compensation claim frequency and durations of disability. Occupational injuries often stem from workers' inexperience with industrial equipment or workplace hazards. During prosperous periods, when firms hire new and less experienced workers, speed up production, and expand overtime work, claim frequency rises (NCCI [1991], page 34). Claim severity, however, is low, since employees are eager to return to work and jobs are available.

The opposite pattern occurs during recessions. Most employees are experienced, since there is little new hiring, and production is slack; claims frequencies are low. Durations of disability lengthen, however, since there are few jobs available, and alternative employment opportunities for partially disabled workers are rare.

Victor and Fleischman [1990], in a recent reanalysis of data gathered by Boden and Fleischman [1989], find a strong effect of economic conditions on average claim severity, which three attribute to three potential causes:

> "First, higher unemployment may *increase utilization* of workers' compensation income benefits as workers without jobs seek to retain income from whatever sources are available. Some of those unemployed will make claims that they would not have otherwise made, and extend the durations of the claims as long as possible or until job opportunities surface. Some who are receiving benefits will find that they no longer have jobs to which they can return. They seek to extend the duration of benefits. Some with residual disabilities find that they are especially at a competitive disadvantage in the labor market when unemployment rises. In each of these instances, workers may use more medical care in their efforts to establish entitlement or retain benefits.

"Second, when unemployment is higher, some employed workers with relatively minor injuries will be *more reluctant to file* workers' compensation claims, fearing that they may be more vulnerable to lay-off if not currently working. When some minor claims are not brought, it makes the average costs of a claim – medical as well as indemnity – appear to be increasing, as the fraction of more serious cases rises.

'And third, when unemployment rises, the *experience and injury mix* of employed workers changes. Less experienced workers are laid-off, and more experienced workers retained. Less experienced workers tend to be younger, and have more frequent, but less serious injuries. As a consequence, the average severity of injury and average medical costs would increase."[68]

For the individual firm, this relationship is even stronger. Impending layoffs often precipitate an increase of Workers' Compensation claims for minor injuries and latent disease claims, since disability benefits generally exceed unemployment benefits in both duration and amount.[69] Two resulting principles of Workers' Compensation pricing have been suggested, though strong empirical support is hard to produce:

- In a declining industry susceptible to disease claims, the actuary should expect rising costs.
- If a firm faces financial problems that may lead to workforce reductions, the actuary should

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[68] Victor [1990: Major Challenges], page 17, summarizes these results: "Evidence is emerging that workers' compensation benefits are more heavily used in times of economic distress. The severe recession that hit Michigan saw a surge in claims by workers taking early retirement from automobile companies . . . The recession in Texas saw an increase rate of claim filing and a significant increase in the duration of lost time . . ."

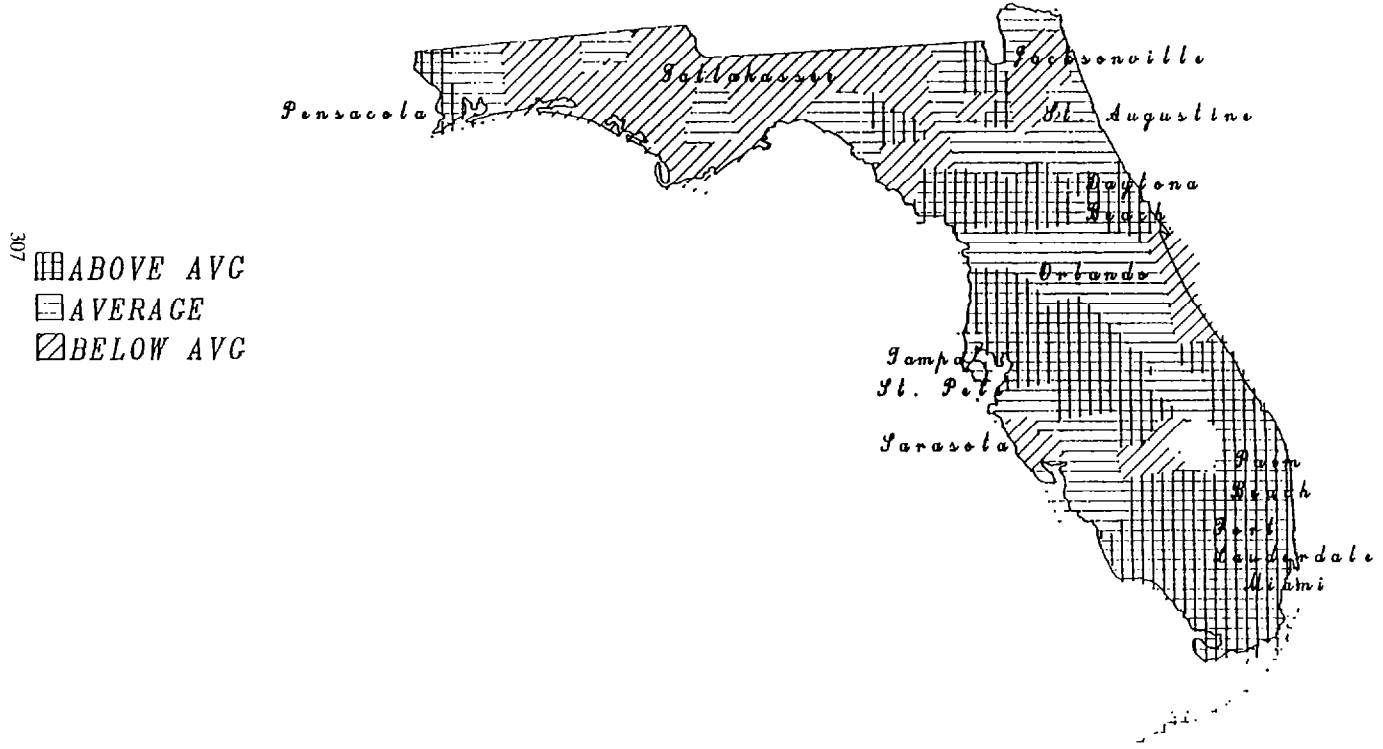
The actual effects of economic conditions on claim frequency and severity are uncertain, most evidence is anecdotal, and generalizations may be premature. Mowbray and Black [1915], p. 425, write: ". . . accident frequency per unit of exposure tends to rise and fall as production rises and falls . . ." and ". . . during times of . . . extreme depression . . . there is a slight lengthening of the average period of disability when compared with that during normal times." Greene and Roeber [1925], pages 254-255, suggest that ". . . the speeding up of industry [in 1916] due to war contracts had increased the accident rate" and that ". . . the depression of 1921-22 marked the beginning of a period of rising compensation costs." See also Whitney and Outwater [1923], pages 153-155.

[69] Cf. Marshall [1954], page 71: ". . . there are many employees working in foundries and similar dusty industries who have already contracted silicosis to some degree and need only to be thrown out of work to become a compensation claim." Marshall also notes ". . . the expected 'catastrophic' nature of the emergence of claims for dust diseases in the event of an economic depression . . ." (page 61).

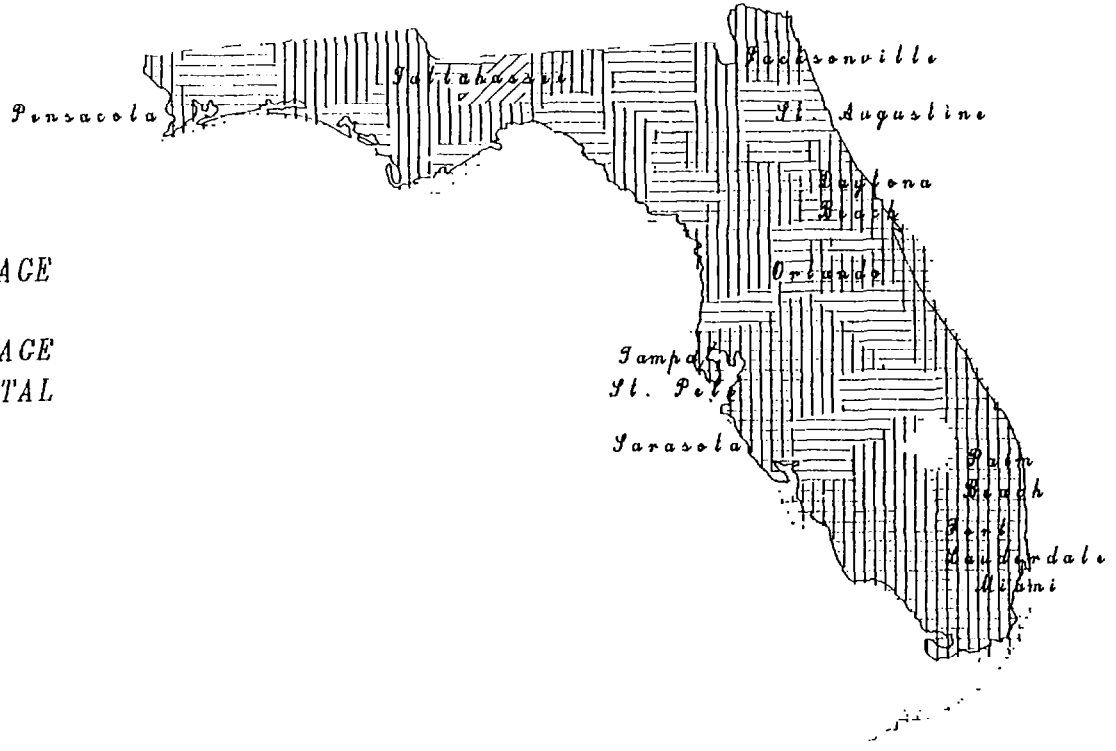
expect a higher incidence of soft-tissue claims, disease claims, and stress claims.

This section has reviewed six classification dimensions: industry, occupation, workforce attributes, group health plan provisions, territory, and financial condition. An administered pricing system requires little classification refinement, and bureau rate making procedures rely primarily on industry. In an open competition environment, however, classification efficiency is paramount. The pricing actuary must understand these influences on claim costs and how each classification variable might be used in setting policy premiums.

FLORIDA
RATIO OF BI TO PD 3 YR. CLAIM COUNTS
BY ISO TERRITORY



FLORIDA
ATTORNEYS PER 1,000 PERSONS
BY COUNTY



BELOW AVERAGE
AVERAGE
ABOVE AVERAGE
STATE CAPITAL

Section 18: Epilogue

"The greatest difficulties in insurance ratemaking do not require access to data or a knowledge of complicated mathematics, but rather the appropriate exercise of informed judgment."

– Mintel [1983], page 2

Until the 1980's, Workers' Compensation was a stable and profitable line of business. Revenues fluctuated rather mildly, crises were short-lived, insurance programs endured, and pricing techniques changed but slowly.

In the late 1970's and 1980's, some parts of the Workers' Compensation system began to unravel. Costs increased, new types of claims emerged, durations of disability lengthened, attorney involvement increased, profits declined, residual markets grew, and better risks began leaving the insurance market. Insurers and rating bureaus have responded with alternative risk management programs, changes to the involuntary pools, and cost containment measures.

As the Workers' Compensation system evolves, pricing actuaries must modify the ratemaking procedures. This section discusses the emerging issues in Workers' Compensation pricing.

A. Loss Costs

The complexities of pricing insurance products, particularly for long-tailed lines like Workers' Compensation, led to administered pricing systems and the partial antitrust exemption embodied in the McCarren-Ferguson Act. In the 1950's and 1960's, rating bureau actuaries developed rates for each line of business. Member companies generally adhered to these rates or deviated by systematic percentages across all classes. The statutory requirements for Workers' Compensation insurance, and the public policy objectives of timely and certain compensation for injured employees, led some states to require membership in rating bureaus and prior approval regulation for rate changes, even if less restrictive regulations were used in other lines.

Administered pricing system sometimes constrain innovative marketing strategies and ratemaking programs. The Personal Lines of insurance, with their large volumes of homogeneous risks, have less need for rating bureaus. Independent, low-cost carriers developed successful ratemaking strategies, and they soon dominated the profitable markets.

By the mid-1980's, pricing independence and innovation was spreading to the Commercial Lines, for several reasons:

- *Saturation:* After "skimming the cream" of the Personal Lines markets, the large direct writers entered the corresponding Commercial Lines markets: small businessowners, Commercial Automobile, CMP, and Personal Lines reinsurance.

- *Imitation:* The dominant Commercial Lines writers observed the successes of independent Personal Lines carriers and began experimenting with similar programs of their own.

- *Judicial Developments:* The right of rating bureaus to require rate adherence by their members was curtailed by the courts in the 1950's. Judicial decisions in the 1980's began chipping away at the McCarren-Ferguson partial antitrust exemption.

- *Politics:* The rising costs of insurance has encouraged some consumer activists and politicians to find inefficiencies and excessive profits in administered pricing systems.

- *Actuarial Expertise:* Casualty actuaries have become more proficient, rate making techniques have evolved, and los-cost, efficient computers have been developed. Even moderate sized carriers can now develop rates independently.

In 1989, the Insurance Services Office announced a transition from advisory rates to loss costs, and by the early 1990's, the National Council on Compensation Insurance followed suit. The coming roles of the rating bureau and company actuaries may vary by jurisdiction, depending on the loss cost system implemented in each state.

B. Elements of Loss Cost Systems

In a loss cost system, the rating bureau does not determine advisory rates. Rather, it provides historical loss data so that member companies can develop their own rates. Loss cost systems vary by jurisdiction. The following section outlines the probable roles of the rating bureau and carriers during the 1990's in loss cost jurisdictions.

Rating bureaus will provide:

- Historical exposure, pure premium, claim count, paid loss, and incurred loss data.
- Development factors, either to ultimate or to an advanced valuation.
- Cost implications of legislative or regulatory changes.
- Factors to bring pure premiums and benefits to current levels.

Member companies must determine

- Underwriting and acquisition expenses reflecting their own operations.
- Underwriting profit provisions.

Differences of opinion exist for several ratemaking procedures:

- *Loss cost trends:* Rating bureaus would like to retain authority to trend losses (Hager [1992], page 193). This is particularly true in Workers' Compensation, where the trend factors are influenced by complex social and economic developments. Some regulators and consumer activists believe that rating bureaus should provide data only. Projections about future changes in loss costs should be left to the carriers.

- *Involuntary pool burdens:* Rating bureaus administer the pools, and they have the best information for estimating their likely costs. As with trending, however, the involuntary market burdens are projections about future costs. Some analysts believe that rating bureaus should provide the needed data (e.g., market shares, pool operating margins, pool underwriting and rating programs), but member carriers should calculate the burden.

- *Assessments:* Assessment rates do not vary by carrier, so a quantification by the bureau

seems efficient. However, there is no need for industry-wide data to estimate the assessment costs.

Unresolved issues with major implications for Workers' Compensation ratemaking include:

- *Experience rating plans:* Until recently, the Workers' Compensation experience rating plan was uniform among insurers and mandatory in almost all jurisdictions. Rating bureaus argue that a mandatory and uniform experience rating plan promotes equity among employers and encourages safety programs. Some insurers respond that the mandatory plan constrains innovative pricing programs; competitive markets require more flexible plans.

- *Classifications:* The most powerful competitive advantages in insurance pricing result from more efficient or more discriminating classification systems. The variety of potential classification dimensions in Workers' Compensation make classification freedom particularly enticing for some insurers. Rating bureaus are concerned, however, that the use of multiple classification systems will destroy the integrity of the Workers' Compensation database and hinder the compilation of industry-wide loss costs.

- *Economic incentives from law amendments:* The indirect incentive effects of statutory benefit changes and reforms of the compensation system are sometimes as great as the direct effects. Presently, rating bureaus quantify the direct cost effects of proposed legislation, which carriers apply to both existing and new policies. The indirect incentive effects are harder to quantify: they vary among groups of insureds and by type of compensation system. It is unclear how the indirect effects will be handled in a loss cost environment.

Some jurisdictions will leave these functions to rating bureaus; others will hand them to the individual carriers. Workers' Compensation pricing actuaries must be competent to deal with these issues as they arise.